EDINBURG
Economic Development Corporation

Edinburg North Park

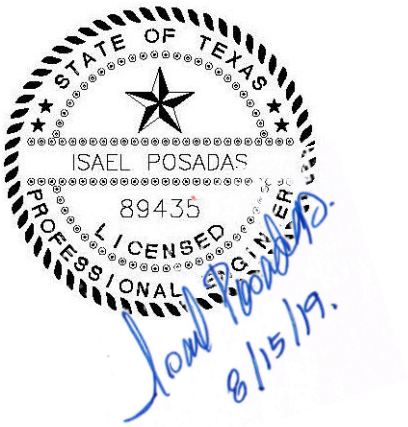
Contract Documents and Specifications

Bid No. 19-001

Edinburg, Texas

2019

Jorge Luis Salinas, Board President
Mike Farias, Vice-President, Secretary-Treasurer
Mayor Richard Molina, Director
Norma Ramirez, Director
Sonia Enriquez, Director



Prepared By:

SDI ENGINEERING, LLC

Civil • Transportation • Planning • Stormwater

REQUEST FOR COMPETITIVE SEALED BIDS AND
NOTICE TO BIDDERS

PROPOSAL: 19-001 Edinburg North Park

OWNER: Edinburg Economic Development Corporation
415 W. University Drive
Edinburg, Texas 78539

ENGINEER: SDI Engineering, LLC
Attn: Isael Posadas, P.E.
5602 E. Iowa Rd.
Edinburg, Texas 78542
PH: 956-287-1818, FAX: 956-287-3697

BID DEADLINE: Wednesday, September 4, 2019 at 3:00 p.m.

INVITATION: Your firm is invited to submit Competitive Sealed Bid Proposals to the OWNER at the OWNER'S address indicated above, for the PROJECT described above, on or before the Deadline indicated.

PRE-BID CONFERENCE: A Pre-Bid conference will be conducted at Edinburg City Hall, Council Chambers, located at 415 W. University Drive, Edinburg, Texas on **Tuesday, August 27, 2019 at 10:00 a.m.** All prospective bidders are encouraged to attend.

INSPECTION OF SITE: The site is accessible for inspection upon notification and coordination with the OWNER. Bidders are encouraged to visit the sites and assess existing conditions.

BID DOCUMENTS: Copies of the Bid Documents, including Drawings, Contract Documents and Technical Specifications may be obtained from the ENGINEER'S office at a cost of $100 (non-refundable), made payable to SDI Engineering, LLC.

BID SECURITY: Bidders will be required to provide a Bid Security in the form of a Bid Bond, Certified Check, or Cashier's Check in the amount of 5% of the largest possible total bid, including consideration of bid alternates, with each proposal. Bid Bonds shall be issued by a Surety acceptable to the OWNER and meeting the requirements of the General Conditions of the Contract. Bid Bonds shall be prepared on forms meeting all the requirement of applicable State of Texas statutes. Failure to provide the Bid Bond with the proposal will constitute a non-responsive proposal and the proposal will not be considered.

PERFORMANCE AND LABOR AND MATERIAL PAYMENT BONDS: The successful offeror will be required to provide 100% Performance and Labor and Materials Payment Bonds in strict conformance with all the requirements of the Contract Documents. Failure to do so will result in cancellation of the contract award and forfeiture of the Bid Bond security as liquidated damages.

BID WITHDRAWAL: Proposals will be required to be submitted under a condition of irrevocability for a period of 60 days after submission. No proposal may be withdrawn for a period of 60 days.

OWNER'S RIGHT OF REJECTION: The OWNER reserves the right to waive any informality, or to reject any or all bid proposals.

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APPENDIX D

THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA

CONSTRUCTION CONTRACTOR'S QUALIFICATION STATEMENT FOR ENGINEERED CONSTRUCTION

This qualification statement was developed by AGC of America in cooperation with the Engineers Joint Contract Documents Committee (EJCDC) which recommend its use as a suggested generic prequalification statement or a contract-specific qualification statement. In the latter case, the owner or engineer may wish to make appropriate supplemental inquires.

The Engineers Joint Contract Documents Committee consists of representatives of the following organizations:

National Society of Professional Engineers
American Consulting Engineers Council
American Society of Civil Engineers
Construction Specifications Institute

The contents of this statement are CONFIDENTIAL.

Submitted by:

Name of Organization _____

Name of Individual _____

Title _____

Address _____

_____

_____

Telephone _____

Submitted to:

Name _____

Address _____

_____

_____

Telephone _____

Project Name and Description (if applicable)

_____

_____

_____

_____

Contractor's General Business Information

Check If:

❑ Corporation ❑ Partnership ❑ Joint Venture ❑ Sole Proprietorship

If Corporation:

a. Date and State of Incorporation

_____

_____

b. List of Executive Officers

Name	Title

If Partnership:

a. Date and State of Organization

b. Names of Current General Partners

c. Type of Partnership

❑ General ❑ Publicly Traded

❑ Limited ❑ Other (describe):_____

If Joint Venture:

a. Date and State of Organization

b. Name, Address and Form of Organization *of* Joint Venture Partners: (Indicate managing partner by an asterisk *)

If Sole Proprietorship:

a. Date and State of Organization

b. Name and Address of Owner or Owners

1. On Schedule A, attached, list major engineered construction projects completed by this organization in the past five (5) years. (If joint venture, list each participant's projects separately).

2. On Schedule B, attached, list current projects under construction by this organization. (If joint venture, list each participant's projects separately).

3. Name of surety company and name, address, and phone number of agent.

_____

_____

_____

4. Is your organization a member of a controlled group of corporations as defined in I.R.C. Sec. 1563?
❑ Yes ❑ No

   If yes, show names and addresses of affiliated companies.

_____

_____

5. Furnish on Schedule C, attached, details of the construction experience of the principal individuals of your organization directly involved in construction operations.

6. Has your organization ever failed to complete any construction contract awarded to it? ❑ Yes ❑ No

   If yes, describe circumstances on attachment.

7. Has any Corporate officer, partner, joint venture participant or proprietor ever failed to complete a construction contract awarded to him or her in their own name or when acting as a principal of another organization?
❑ Yes ❑ No

   If yes, describe circumstances on attachment.

8. In the last five years, has your organization ever failed to substantially complete a project in a timely manner?
❑ Yes ❑ No

   If yes, describe circumstances on attachment.

9. Indicate general types of work performed with your own work force.

_____

_____

10. If required, can your organization provide a bid bond for this project? ❑ Yes ❑ No

11. What is your approximate total bonding capacity?

   ❑ $500,000 to $2,000,000

   ❑ $2,000,000 to $5,000,000

   ❑ $5,000,000 to $10,000,000

   ❑ $10,000,000 or more

12. Describe the permanent safety program you maintain within your organization. Use attachment if necessary.

13. Furnish the following information with respect to an accredited banking institution familiar with your organization.

Name of Bank _____

Address _____

_____

_____

Account Manager _____

Telephone _____

I hereby certify that the information submitted herewith, including any attachment is true to the best of my knowledge and belief.

By: _____

Title: _____

Dated: _____

SCHEDULE A

Name, Location and Description of Project	Owner	Design Engineer	Date Completed	Contract Price	Reference/Contact Include Address and Phone

SCHEDULE B

Name, Location and Description of Project	Owner	Design Engineer	Contract Price	Amount Completed	Date of Scheduled Completion	Reference/Contact Include Address and Phone

SCHEDULE C - PERSONNEL

Name	Position	Date started with this organization	Date started in construction	Prior positions and experience in construction

SECTION 00615 – PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

PART 1 – GENERAL

1.1 RELATED DOCUMENTS: PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND:

A. The contractor shall, prior to the execution of the Contract, furnish bonds covering the faithful performance of the Contract and the payment of all obligations arising thereunder in the amount of 100% of the Contract Price covering 100% performance and 100% payment, and with such sureties secured through the contractor's usual sources as may be agreeable to the parties.

B. The Contractor shall deliver the required bonds to the Owner no later than the date of execution of the Contract, or if the work is commenced prior thereto in response to a letter of intent, the Contractor shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be finished.

C. The Contractor shall require the Attorney-In-Fact who executes the required bonds on behalf of the surety to affix a certificate and current copy of the Power of Attorney.

D. Any Payment Bond and Performance Bond furnished pursuant to the provisions of Art. 5160, Vernon's Texas Civil Statutes, connected with this project, shall be furnished by a corporate surety or corporate or corporate sureties in accordance with Article 7.19-1, Vernon's Texas Insurance Code, that has a stated capital and surplus (as reported by it to the Texas Insurance Commission in its most recent report) that is in excess of ten times the stated amount of the Payment Bond or the Performance Bond. Provided however, that if any Payment Bond or any Performance Bond is in an amount in excess of ten percent (10%) of the surety company's capital and surplus (as reported to the Texas Insurance Commission in its most recent report), as a condition to accepting the bond, the Owner must receive written certification and information, satisfactory in form and substance to the Owner, that the surety company has reinsured the portion of the risk that exceeds ten percent (10%) of the surety company's capital and surplus, with one or more reinsurers who are duly authorized, accredited or trusteed to do business in the State of Texas. For the purpose of this requirement, any amount reinsured by any reinsurer may not exceed ten percent (10%) of the reinsurer's capital and surplus (as reported to the Texas Insurance Commission by the reinsurer in its most recent report). In the event there is one or more reinsurer, the surety company must provide all necessary information and certification related to the current financial condition of the surety company and any and all reinsurers required by the Owner, together with copies of all reinsurance contracts with the surety company, before any such Payment Bond and Performance Bond is eligible to be considered acceptable by the Owner.

E. ALL CONTRACTORS SHALL SUBMIT THE NAME, ADDRESS AND TELEPHONE NUMBER OF THE CORPORATE SURETIES PROVIDING THE PAYMENT AND PERFORMANCE BONDS AND THE LOCAL AGENT.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION

FELONY CONVICTION NOTIFICATION

State of Texas Legislative Senate Bill No. 1, Section 44.034, Notification of Criminal History, Subsection (a), states "a person or business entity that enters into a contract with a public entity must give advance notice to the entity if the person or an owner or operator of the business entity has been convicted of a felony. The notice must include a general description of the conduct resulting in the conviction of a felony."

This Notice Is Not Required of a Publicly-Held Corporation

I, the undersigned agent for the firm named below, certify that the information concerning notification of felony convictions has been reviewed by me and the following information furnished is true to the best of my knowledge.

_____
Vendor's Name

_____
Authorized Company Official's Name (Printed)

A. My firm is a publicly-held corporation; therefore, this reporting requirement is not applicable.

_____
Signature of Company Official

B. My firm is not owned nor operated by anyone who has been convicted of a felony:

_____
Signature of Company Official

C. My firm is owned or operated by the following individual(s) who has/have been convicted of a felony:

_____
Names of Felon(s)

_____
Details of Conviction(s)

_____
Signature of Company Official

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor or other person doing business with local governmental entity

This questionnaire is being filed in accordance with chapter 176 of the Local Government Code by a person doing business with the governmental entity.

By law this questionnaire must be filed with the records administrator of the local government not later than the 7th business day after the date the person becomes aware of facts that require the statement to be filed. *See* Section 176.006, Local Government Code.

A person commits an offense if the person violates Section 176.006, Local Government Code. An offense under this section is a Class C misdemeanor.

OFFICE USE ONLY

Date Received

1 **Name of person doing business with local governmental entity.**

2

☐ **Check this box if you are filing an update to a previously filed questionnaire.**

(The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than September 1 of the year for which an activity described in Section 176.006 (a), Local Government Code, is pending and not later than the 7th business day after the date the originally filed questionnaire becomes incomplete or inaccurate.)

3 **Describe each affiliation or business relationship with an employee or contractor of the local governmental entity who makes recommendations to a local government officer of the local governmental entity with respect to expenditure of money.**

4 **Describe each affiliation or business relationship with a person who is a local government officer and who appoints or employs a local government officer of the local governmental entity that is the subject of this questionnaire.**

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ
Page 2

For vendor or other person doing business with local governmental entity

5 **Name of local government officer with whom filer has affiliation or business relationship. (Complete this section only if the answer to A, B, C is YES.)**

This section, item 5 including subparts A, B, C & D, must be completed for each officer with whom the filer has affiliation or business relationship. Attach additional pages to this Form CIQ as necessary

A. Is the local government officer named in this section receiving or likely to receive taxable income from the filer of the questionnaire?

Yes ☐ No ☐

B. Is the filer of the questionnaire receiving or likely to receive taxable income from or at the direction of the local government officer named in this section AND the taxable income is not from the local governmental entity?

☐ Yes ☐ No

C. Is the filer of this questionnaire affiliated with a corporation or other business entity that the local government officer serves as an officer or director, or holds an ownership of 10 percent or more?

☐ Yes ☐ No

D. Describe each affiliation or business relationship.

6 **Describe any other affiliation or business relationship that might cause a conflict of interest.**

7

_____ _____

Signature of person doing business with governmental entity Date

DEVIATION FORM

(This form must be signed)

1. DEVIATION(S) – Any deviations to the attached specifications shall be listed below, or on a separate sheet of paper, and attached to the bid response form identifying the section number, item number and a clearly defined explanation for the deviations.

2. It is the bidder's responsibility to submit a bid that meets all mandatory specifications stated within. Because of the variations in manufacturer's construction, the bidder must compare their product bid with the required listed minimum specifications and identify any deviations.

3. Failure to properly identify deviations may render the bidder's proposal non-responsive and not capable of consideration for award.

4. Bidders should note that a descriptive brochure of the model bid may not be sufficient or acceptable as proper identification of deviations from the written specifications.

   NO - Deviations:_____ YES - Deviations:_____

List any deviations your company is submitting below: (List on separate page, if necessary)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____
Company Name

_____
Print Name of Authorized Company Official

_____
Signature of Authorized Company Official

SECTION 00149 – WAGE RATE

PART 1 – GENERAL

1.1 PREVAILING WAGE RATE DETERMINATION INFORMATION

A. The following information is from Chapter 2258 Texas Government Code:

1. 2258.021 Right to be Paid Prevailing Wage Rates
   a. A worker employed on a public work by or on behalf of the state or a political subdivision of the state shall be paid:
   1). Not less than the general prevailing rate of per diem wages for work of a similar character in the locality in which the work is performed; and
   2). Not less than the general prevailing rate of per diem wages for legal holiday and overtime work.
   b. Subsection (a) does not apply to maintenance work.
   c. A worker is employed on a public work for the purposes of this section if the worker is employed by a subdivision of the state.

2. 2.2258.023 Prevailing Wage Rates to be paid by Contractor and Subcontractor; Penalty
   a. The Contractor who is awarded a contract by a public body or a subcontractor of the contractor shall pay not less than the rates determined under Section 2258.022 to a worker employed by it in the execution of the contract.
   b. A contractor or subcontractor who violates this section shall pay to the state or a political subdivision of the state on whose behalf the contract is made, $60 for each worker employed for each calendar day or part of the day that the worker is paid less than the wage rates stipulated in the contact. A public body awarding a contract shall specify this penalty in the contract.
   c. A contactor or subcontractor does not violate this section if a public body awarding a contract does not determine the prevailing wage rates and specify the rates in the contract as provided by Section 2258.022.
   d. The public body shall use any money collected under this section to offset the costs incurred in the administration of this chapter.
   e. A municipality is entitled to collect a penalty under this section only if the municipality has a population of more than 10,000.

3. 2258.051 Duty of Public Body to Hear Complaints and Withhold Payment
   a. A public body awarding a contract, and an agent or officer of the public body, shall:
      1). Take organization to complaints of all violations of this chapter committed in the execution of the contract of the contract; and
      2). Withhold money forfeited or the contact to be withheld under this chapter from the payments to the contractor under the contract; except that the public body may not withhold money from other than the final payment without determination by the public body that there is good cause to believe that the contractor has violated this chapter.

1.2 PREVAILING WAGE RATES

A. Comply with the requirements of the Vernon's civil statutes of the State of Texas, Annotated, revised 1995, Article 5159.

B. In no case shall any laborer, workman or mechanic employed by the General Contractor or any Subcontractor, for the execution of the project, be paid less than the current federal minimum wage.

C. Work Classification Definition: See Texas Government Code

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

CERTIFICATION OF INTERESTED PARTIES – FORM 1295

Definitions and Instructions for Completing Form 1295

Edinburg Economic Development Corporation (EEDC) is required to comply with House Bill 1295, which amended the Texas Government Code by adding Section 2252.908, Disclosure of Interested Parties. Section 2252.908 prohibits EEDC from entering into a contract resulting from Bid, CSP, RFP, RFQ, Inter-local Cooperative Quote with a business entity unless the business entity submits a Disclosure of Interested Parties – Form 1295 to EEDC at the time the business entity submits the signed contract. The Texas Ethics Commission has adopted rules requiring the business entity to file Form 1295 electronically with the Texas Ethics Commission.

As a "business entity," all vendors must electronically complete, print, sign, notarize and submit Form 1295 with their proposals or contracts even if no interested parties exist.

Proposers must file Certificate of Interested Parties – Form 1295 with the Texas Ethics Commission using the following online application:
https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm

- Proposers must use the filing application on the Texas Ethics Commission's website (see link above) to enter the required information on Form 1295.
- Proposers must print a copy of the completed form, which will include a certification of filing containing a unique certification number.
- The Form 1295 must be printed and then singed by an authorized agent of the business entity, and the form must be notarized.
- The completed Form 1295 with the certification of filing must be filed with EEDC by including a copy of the completed/notarized form with the proposal response.
- EEDC must acknowledge the receipt of the filed Form 1295 by notifying the Texas Ethics Commission of the Receipt of the filed Form 1295 no later than the 30th day after the date the contract binds all parties on the contract.
- After EEDC acknowledges the Form 1295, the Texas Ethics Commission will post the completed form 1295 to its website within seven (7) business days after receiving notice from EEDC.

Instructions to Vendors:

1. Read these instructions,
2. Go to the Ethics Commission Website: https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm,
3. Register and complete Form 1295 online – include the bid/proposal # and the contract Bid, CSP, RFQ, RFP, name,
4. Print a copy of the submitted Form 1295 and have it notarized – it will have a certification # in the top right corner,
5. Include a copy of the completed, signed and notarized Form 1295 with the proposal response.

Definitions:

- **Interested Party:** a person who:
  1) Has controlling interest in a business entity with whom EEDC contracts; or
  2) Actively participates in facilitating a contract or negotiating the terms of a contract, including a broker, intermediary, adviser, or attorney for the business entity.
- **Controlling Interest means:**

1) An ownership interest or participating interest in a business entity by virtue of units, percentage, shares, stock, or otherwise that exceeds 10 percent
2) Membership on the board of directors or other governing body of a business entity of which the board or other governing body is composed of not more than 10 members, or
3) Service as an officer of a business entity that has four of fewer officers or service as one of the four officers most highly compensated by a business entity that has more than four officers.

- **Intermediary:** a person who actively participates in the facilitation of the contract or negotiating the contract including a broker advisor attorney representative of or agent for the business entity who:
  1) Receives compensation from the business entity for the persons participation;
  2) Communicates directly with the governmental entity or state agency on behalf of the business entity regarding the contract, and
  3) Is not an employee of the business entity
- **Business Entity:** includes an entity through which business is conducted with a governmental entity or state agency, regardless of whether the entity is a for profit or nonprofit entity

Resources:
Form 1295 Frequently Asked Questions:

- https://www.ethics.state.tx.us/whatsnew/FAQ_Form1295.html

Instructional Video – First Time Business User:

- https://www.ethics.state.tx.us/filinginfo/videos/Form1295/FirstLogin-Business/Form1295Login-Business.html

Instructional Video – How to Create a Certificate:

- https://www.ethics.state.tx.us/filinginfo/videos/Form1295/CreateCertificate/CreateCertificate.html

HOUSE BILL 89 VERIFICATION

I, _____, the undersigned representative of

_____, (Company or Business name) (hereafter referred to as company) being an adult over the age of eighteen (18) years of age, verify that the company named-above, under the provisions of Subtitle F, Title 10, and Government Code Chapter 2270:

1. Does not boycott Israel currently; and

2. Will not boycott Israel during the term of the contract.

3) Is not currently listed on the State of Texas Comptroller's Companies that Boycott Israel List located at https://comptroller.texas.gov/purchasing/publications/divestment.php

Pursuant to Section 2270.001, Texas Government Code:

1. "Boycott Israel" means refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes; and

2. "Company" means a for-profit sole proprietorship, organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or any limited liability company, including a wholly owned subsidiary, majority-owned subsidiary, parent company or affiliate of those entities or business associations that exist to make a profit.

_____

SIGNATURE OF COMPANY REPRESENTATIVE:

_____

TYPE/PRINT NAME AND TITLE:

_____

DATE:

INSTRUCTION TO BIDDERS

1. Copies of Bidding Documents

Complete sets of the Bidding Documents in the number and for the sum, if any stated in the Notice to Bidders may be obtained from the Issuing Office. The sum will not be refunded to each document holder of record.

Complete sets of Bidding Documents must be used in preparing Bids; neither Owner nor Engineer assume responsibility for errors or misinterpretations resulting from use of incomplete set of bidding Documents.

Owner and Engineer in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not offer a license or grant for any other use.

2. Qualifications of Bidders

To demonstrate qualifications to perform the Work, each bidder must be prepared to submit within five (5) days after Bid opening upon Owner's request detailed written evidence such as financial data, previous experience, present commitments and other such data as may be called for in the Bidding Documents.

3. Examination of Contract Documents and Site

It is the responsibility of each Bidder before submitting a Bid: To examine thoroughly the Contract Documents and other related data identified in the Bidding Documents;

To visit the site to become familiar with and satisfy Bidder as to the general, local and site conditions that may affect cost, progress, performance or furnishing of the Work;

To consider federal, state, and local Laws and Regulations that may affect cost progress, performance of furnishing of the Work;

To study and carefully correlate Bidder's knowledge and observations with the Contract Documents and such other related data; and

To promptly notify Engineer of all conflicts, errors, ambiguities or discrepancies which the Bidder has discovered in or between the Contract Documents and such other related documents.

Information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities or others, and Owner and Engineer do not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in Supplementary Conditions.

Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Contract Documents due to differing or unanticipated conditions appear in the General Conditions.

Before submitting a Bid each Bidder will be responsible to obtain such additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise, which may affect cost, progress, performance, or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

On request, Owner will provide each Bidder access to the site to conduct such examinations, investigations, explorations, tests and studies, as each Bidder deems necessary for submission of a Bid. Bidder must fill all holes and clean up and restore site to its former conditions upon completion of such explorations, investigations, tests and studies or at the end of each day.

The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 3, that without exception the Bid is premised upon performing and furnishing the Work required by the Contract Documents and applying the specific means, methods, techniques, sequences or procedures of construction (if any) that may be shown or indicated or expressly required by the Contract Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities and discrepancies that Bidder has discovered in the Contract Documents and the written resolutions thereof by Engineer is acceptable to Bidder, and that the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

4. Availability of Lands for Work

The lands upon which the Work is to be performed, rights-of-way and easements for access thereto and other lands designated for use by the Contractor in performing the Work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by the Contractor. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Contract Documents.

5. Interpretations and Addenda

All questions about the meaning or intent of the Bidding Documents are to be directed to Engineer. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than seven (7) days prior to the date for opening of

Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral or other interpretations or clarifications will be without legal effect.

6. Bid Security

Each Bid must be accompanied by Bid security made payable to the Owner in the amount of five (5) percent of Bidder's maximum bid price and in the form of a certified check or Bid Bond issued by a surety meeting the requirements of the Contract Documents and authorized in the State of Texas.

The Bid security of Successful Bidder will be retained until such Bidder has executed the Agreement, furnished the required contract security and met other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Agreement and furnish the required contract security within fifteen days after Notice of Award, Owner may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of the other Bidders whom the Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of the seventh day after the Effective Date of the Agreement, whereupon Bid security furnished by such Bidders will be returned.

7. Contract Times

The number of days within which, or the dates by which, the Work is to be substantially completed and ready for final payment are set forth in the Agreement or incorporated therein by reference to the attached Bid Form.

8. Liquidated Damages

Provisions for liquidated damages, if any, are set forth in the Agreement or incorporated therein by reference to the attached Bid Form.

9. Substitute and "Or-Equal" Items

The Contract, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or-equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or "or-equal" item of material or equipment may be furnished or used by Contractor if acceptable to Engineer, application for such acceptance will not be considered by Engineer until after the Effective Date of the agreement. The procedure for submission of any such application by Contractor and consideration by Engineer is set forth in the General Conditions.

10. Subcontractors, Suppliers and Others

Within ten (10) days after Bid opening, the Contractor shall submit to the Owner a list of all Subcontractors, Suppliers, and other persons and organizations (including those who are to furnish the principal items of material and equipment) proposed for the Project. Such list shall

be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, person or organization. The Owner or Engineer, who after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, other person or organization, may request the apparent Successful Bidder provide an acceptable substitute without an increase in Bid price before the Notice of Award is given.

If the apparent Successful Bidder declines to make any such substitution, Owner may award contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers and other persons and organizations. The declining to make requested substitutions will not constitute grounds for sacrificing the Bid security of any Bidder. Any Subcontractor, Supplier, other person or organization listed and to whom Owner or Engineer does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer, subject to revocation of such acceptance after the Effective date of the Agreement as provided in the General Conditions.

11. Bid Form

The Bid Form is included with the Bidding Documents; additional copies may be obtained from the Engineer.

All blanks on the Bid Form must be completed by printing in black ink or by typewriter.

Bids by corporations must be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown below the signature.

Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.

All names must be typed or printed in black ink below the signature.

The Bid shall contain an acknowledgement of receipt of all Addenda the numbers of which must be filled in on the Bid Form.
The address and telephone number of communications regarding the Bid must be shown.

Evidence of authority to conduct business as an out-of-state corporation in the State of Texas where the Work is to be performed shall be provided in accordance with above.

12. Submission of Bids

Bids shall be submitted at the time and place indicated in the Notice to Bidders and shall be enclosed in an opaque sealed envelope, marked with the Project title and number, and name and address of Bidder and accompanied by the Bid security and other required documents. If the Bid

is sent through mail or other delivery system the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face of it.

13. Modifications and Withdrawal of Bids

Bids may be modified or withdrawn by an appropriate document duly executed (in a manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

All Bids opened and read aloud will not be withdrawn or modified.

14. Bids to Remain Subject to Acceptance

All Bids will remain subject to acceptance for ninety (90) days after the day of the Bid opening, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to that date.

15. Award of Contract

Owner reserves the right to reject any or all Bids, including without limitation the rights to reject any or all nonconforming, non-responsive, unbalanced or conditional Bids and to reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by the Owner. Owner also reserves the right to waive all informalities not involving price, time or changes in Work and to negotiate contract terms with the Successful Bidder. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words. Discrepancies between the unit price and the indicated sum of any column of figures, the unit price shall prevail. In evaluating Bids, Owner will consider the qualifications of Bidders, whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

Owner may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations is required.

Owner may also consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to Notice of Award.

If contract is to be awarded, it will be awarded to the lowest Bidder whose evaluation by Owner indicates to Owner that the award will be in the best interest of the Project.

16. Contract Security

The General Conditions and the Supplementary Conditions sets forth the Owner's requirements as to performance and payment Bonds. When the successful Bidder delivers the executed Agreement to Owner, it must be accompanied by the required performance and payment Bonds.

17. Signing of Agreement

When Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with all other written Contract Documents attached. Within fifteen (15) days thereafter Contractor shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner with the required Bonds. Thereafter Owner shall deliver five (5) fully signed counterparts to Contractor, during the Preconstruction Conference. Each counterpart is to be accompanied by a complete set of Drawings with appropriate identification.

18. Pre-bid Conference

A pre-bid conference will be held at the location designated on the Notice to Bidders. Representatives of Owner and Engineer will be present to discuss Project. Bidders are encouraged to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

19. Sales and Use Taxes

The Bidder's attention is directed to the State of Texas Comptroller of Public Accounts Limited Sales Excise and Use Tax Rules and Regulations, paragraph 3, of Ruling No.9, Repairmen and Contractors (amended April 3,1972). Reference Article 20.01 (T). Upon compliance with certain conditions this ruling provides for exemption for this tax of materials incorporated into work done for an exempt agency under a contract. The Owner is an exempt agency.

Any Bidder may elect to exclude this sales tax from his bid. If the Bidder submitting the lowest acceptable Bid for performing the Work on this Project elects to comply with the above ruling on any item included in this contract by obtaining any necessary permit or permits from the State of Comptroller allowing the purchase of material incorporation into this Project without having to pay the Limited Sales, Excise and Use Tax at the time of purchase, Bidder shall upon award of contract submit statement in satisfactory form in which his Bid prices to the Owner for materials are listed separately from all other charges, either by Bid item or by total as required by the Comptroller. This statement shall be included in and made a part of the contract.

The Owner will furnish the Bidder with its exemption certificate for those materials incorporated in the project for which the above required statement is submitted.

The Owner will make no further allowance for and will make no price adjustment above or below the originally Bid unit price on account of tax. It shall be the Bidder's sole responsibility, if he/she elects to exclude the sales tax from his/her bid, to comply with the aforementioned

ruling No.9 and with any other applicable rules, regulations, or laws pertaining to the Texas Limited Sales, Excise and Use Tax which may now or at any time during the performance of this contract be in effect, and the Owner shall have no responsibility for any sales or use tax which the Bidder may be required to pay as the result of his failure or the Owner's failure to comply with said rules, regulations or laws, or as the result of the performance of the contract or any part thereof by the Bidder.

Bidders are cautioned that materials, which are not permanently incorporated into the work, are not eligible for exemption and are not to be included in the statement as "Materials" (example: fuels, lubricants, tools, forming materials, etc.).

The Bidder shall make his own determination as to tax liabilities for purchases made in other states.

20. Guarantee

The Bidder shall guarantee the work for a period of one (1) year after date of acceptance in writing by the Owner. During this period, the Contractor shall make any repairs and/or replacements of defective materials and corrections due to poor workmanship, all as may be required for full compliance with the Contract Documents. This guarantee shall apply to all matters reported by the Owner in writing within the said one (1) year period and this guarantee shall be covered by the extension of the Performance Bond.

Form **W-9**
(Rev. October 2018)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

▶ **Go to *www.irs.gov/FormW9* for instructions and the latest information.**

Give Form to the requester. Do not send to the IRS.

Print or type. See **Specific Instructions** on page 3.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.

2 Business name/disregarded entity name, if different from above

3 Check appropriate box for federal tax classification of the person whose name is entered on line 1. Check only **one** of the following seven boxes.

☐ Individual/sole proprietor or single-member LLC ☐ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate

☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=Partnership) ▶ _____

Note: Check the appropriate box in the line above for the tax classification of the single-member owner. Do not check LLC if the LLC is classified as a single-member LLC that is disregarded from the owner unless the owner of the LLC is another LLC that is **not** disregarded from the owner for U.S. federal tax purposes. Otherwise, a single-member LLC that is disregarded from the owner should check the appropriate box for the tax classification of its owner.

☐ Other (see instructions) ▶

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):

Exempt payee code (if any) _____

Exemption from FATCA reporting code (if any) _____

(Applies to accounts maintained outside the U.S.)

5 Address (number, street, and apt. or suite no.) See instructions.

Requester's name and address (optional)

6 City, state, and ZIP code

7 List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN,* later.

Note: If the account is in more than one name, see the instructions for line 1. Also see *What Name and Number To Give the Requester* for guidelines on whose number to enter.

Social security number

			–			–				

or

Employer identification number

		–							

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here **Signature of U.S. person** ▶ **Date** ▶

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to *www.irs.gov/FormW9.*

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)
- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding, *later.*

By signing the filled-out form, you:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),

2. Certify that you are not subject to backup withholding, or

3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and

4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct. See *What is FATCA reporting,* later, for further information.

Note: If you are a U.S. person and a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien;
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States;
- An estate (other than a foreign estate); or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax under section 1446 on any foreign partners' share of effectively connected taxable income from such business. Further, in certain cases where a Form W-9 has not been received, the rules under section 1446 require a partnership to presume that a partner is a foreign person, and pay the section 1446 withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid section 1446 withholding on your share of partnership income.

In the cases below, the following person must give Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States.

- In the case of a disregarded entity with a U.S. owner, the U.S. owner of the disregarded entity and not the entity;
- In the case of a grantor trust with a U.S. grantor or other U.S. owner, generally, the U.S. grantor or other U.S. owner of the grantor trust and not the trust; and
- In the case of a U.S. trust (other than a grantor trust), the U.S. trust (other than a grantor trust) and not the beneficiaries of the trust.

Foreign person. If you are a foreign person or the U.S. branch of a foreign bank that has elected to be treated as a U.S. person, do not use Form W-9. Instead, use the appropriate Form W-8 or Form 8233 (see Pub. 515, Withholding of Tax on Nonresident Aliens and Foreign Entities).

Nonresident alien who becomes a resident alien. Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a "saving clause." Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the payee has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items.

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.

2. The treaty article addressing the income.

3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.

4. The type and amount of income that qualifies for the exemption from tax.

5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

Example. Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if his or her stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first protocol) and is relying on this exception to claim an exemption from tax on his or her scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity, give the requester the appropriate completed Form W-8 or Form 8233.

Backup Withholding

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS 24% of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, payments made in settlement of payment card and third party network transactions, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester,

2. You do not certify your TIN when required (see the instructions for Part II for details),

3. The IRS tells the requester that you furnished an incorrect TIN,

4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or

5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See *Exempt payee code,* later, and the separate Instructions for the Requester of Form W-9 for more information.

Also see *Special rules for partnerships,* earlier.

What is FATCA Reporting?

The Foreign Account Tax Compliance Act (FATCA) requires a participating foreign financial institution to report all United States account holders that are specified United States persons. Certain payees are exempt from FATCA reporting. See *Exemption from FATCA reporting code,* later, and the Instructions for the Requester of Form W-9 for more information.

Updating Your Information

You must provide updated information to any person to whom you claimed to be an exempt payee if you are no longer an exempt payee and anticipate receiving reportable payments in the future from this person. For example, you may need to provide updated information if you are a C corporation that elects to be an S corporation, or if you no longer are tax exempt. In addition, you must furnish a new Form W-9 if the name or TIN changes for the account; for example, if the grantor of a grantor trust dies.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of $50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a $500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Line 1

You must enter one of the following on this line; **do not** leave this line blank. The name should match the name on your tax return.

If this Form W-9 is for a joint account (other than an account maintained by a foreign financial institution (FFI)), list first, and then circle, the name of the person or entity whose number you entered in Part I of Form W-9. If you are providing Form W-9 to an FFI to document a joint account, each holder of the account that is a U.S. person must provide a Form W-9.

a. **Individual.** Generally, enter the name shown on your tax return. If you have changed your last name without informing the Social Security Administration (SSA) of the name change, enter your first name, the last name as shown on your social security card, and your new last name.

Note: ITIN applicant: Enter your individual name as it was entered on your Form W-7 application, line 1a. This should also be the same as the name you entered on the Form 1040/1040A/1040EZ you filed with your application.

b. **Sole proprietor or single-member LLC.** Enter your individual name as shown on your 1040/1040A/1040EZ on line 1. You may enter your business, trade, or "doing business as" (DBA) name on line 2.

c. **Partnership, LLC that is not a single-member LLC, C corporation, or S corporation.** Enter the entity's name as shown on the entity's tax return on line 1 and any business, trade, or DBA name on line 2.

d. **Other entities.** Enter your name as shown on required U.S. federal tax documents on line 1. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on line 2.

e. **Disregarded entity.** For U.S. federal tax purposes, an entity that is disregarded as an entity separate from its owner is treated as a "disregarded entity." See Regulations section 301.7701-2(c)(2)(iii). Enter the owner's name on line 1. The name of the entity entered on line 1 should never be a disregarded entity. The name on line 1 should be the name shown on the income tax return on which the income should be reported. For example, if a foreign LLC that is treated as a disregarded entity for U.S. federal tax purposes has a single owner that is a U.S. person, the U.S. owner's name is required to be provided on line 1. If the direct owner of the entity is also a disregarded entity, enter the first owner that is not disregarded for federal tax purposes. Enter the disregarded entity's name on line 2, "Business name/disregarded entity name." If the owner of the disregarded entity is a foreign person, the owner must complete an appropriate Form W-8 instead of a Form W-9. This is the case even if the foreign person has a U.S. TIN.

Line 2

If you have a business name, trade name, DBA name, or disregarded entity name, you may enter it on line 2.

Line 3

Check the appropriate box on line 3 for the U.S. federal tax classification of the person whose name is entered on line 1. Check only one box on line 3.

IF the entity/person on line 1 is a(n) . . .	THEN check the box for . . .
• Corporation	Corporation
• Individual • Sole proprietorship, or • Single-member limited liability company (LLC) owned by an individual and disregarded for U.S. federal tax purposes.	Individual/sole proprietor or single-member LLC
• LLC treated as a partnership for U.S. federal tax purposes, • LLC that has filed Form 8832 or 2553 to be taxed as a corporation, or • LLC that is disregarded as an entity separate from its owner but the owner is another LLC that is not disregarded for U.S. federal tax purposes.	Limited liability company and enter the appropriate tax classification. (P= Partnership; C= C corporation; or S= S corporation)
• Partnership	Partnership
• Trust/estate	Trust/estate

Line 4, Exemptions

If you are exempt from backup withholding and/or FATCA reporting, enter in the appropriate space on line 4 any code(s) that may apply to you.

Exempt payee code.

- Generally, individuals (including sole proprietors) are not exempt from backup withholding.
- Except as provided below, corporations are exempt from backup withholding for certain payments, including interest and dividends.
- Corporations are not exempt from backup withholding for payments made in settlement of payment card or third party network transactions.
- Corporations are not exempt from backup withholding with respect to attorneys' fees or gross proceeds paid to attorneys, and corporations that provide medical or health care services are not exempt with respect to payments reportable on Form 1099-MISC.

The following codes identify payees that are exempt from backup withholding. Enter the appropriate code in the space in line 4.

1—An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2)

2—The United States or any of its agencies or instrumentalities

3—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities

4—A foreign government or any of its political subdivisions, agencies, or instrumentalities

5—A corporation

6—A dealer in securities or commodities required to register in the United States, the District of Columbia, or a U.S. commonwealth or possession

7—A futures commission merchant registered with the Commodity Futures Trading Commission

8—A real estate investment trust

9—An entity registered at all times during the tax year under the Investment Company Act of 1940

10—A common trust fund operated by a bank under section 584(a)

11—A financial institution

12—A middleman known in the investment community as a nominee or custodian

13—A trust exempt from tax under section 664 or described in section 4947

The following chart shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 13.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt payees except for 7
Broker transactions	Exempt payees 1 through 4 and 6 through 11 and all C corporations. S corporations must not enter an exempt payee code because they are exempt only for sales of noncovered securities acquired prior to 2012.
Barter exchange transactions and patronage dividends	Exempt payees 1 through 4
Payments over $600 required to be reported and direct sales over $5,000[1]	Generally, exempt payees 1 through 5[2]
Payments made in settlement of payment card or third party network transactions	Exempt payees 1 through 4

[1] See Form 1099-MISC, Miscellaneous Income, and its instructions.

[2] However, the following payments made to a corporation and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, gross proceeds paid to an attorney reportable under section 6045(f), and payments for services paid by a federal executive agency.

Exemption from FATCA reporting code. The following codes identify payees that are exempt from reporting under FATCA. These codes apply to persons submitting this form for accounts maintained outside of the United States by certain foreign financial institutions. Therefore, if you are only submitting this form for an account you hold in the United States, you may leave this field blank. Consult with the person requesting this form if you are uncertain if the financial institution is subject to these requirements. A requester may indicate that a code is not required by providing you with a Form W-9 with "Not Applicable" (or any similar indication) written or printed on the line for a FATCA exemption code.

A—An organization exempt from tax under section 501(a) or any individual retirement plan as defined in section 7701(a)(37)

B—The United States or any of its agencies or instrumentalities

C—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities

D—A corporation the stock of which is regularly traded on one or more established securities markets, as described in Regulations section 1.1472-1(c)(1)(i)

E—A corporation that is a member of the same expanded affiliated group as a corporation described in Regulations section 1.1472-1(c)(1)(i)

F—A dealer in securities, commodities, or derivative financial instruments (including notional principal contracts, futures, forwards, and options) that is registered as such under the laws of the United States or any state

G—A real estate investment trust

H—A regulated investment company as defined in section 851 or an entity registered at all times during the tax year under the Investment Company Act of 1940

I—A common trust fund as defined in section 584(a)

J—A bank as defined in section 581

K—A broker

L—A trust exempt from tax under section 664 or described in section 4947(a)(1)

M—A tax exempt trust under a section 403(b) plan or section 457(g) plan

Note: You may wish to consult with the financial institution requesting this form to determine whether the FATCA code and/or exempt payee code should be completed.

Line 5

Enter your address (number, street, and apartment or suite number). This is where the requester of this Form W-9 will mail your information returns. If this address differs from the one the requester already has on file, write NEW at the top. If a new address is provided, there is still a chance the old address will be used until the payor changes your address in their records.

Line 6

Enter your city, state, and ZIP code.

Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN.

If you are a single-member LLC that is disregarded as an entity separate from its owner, enter the owner's SSN (or EIN, if the owner has one). Do not enter the disregarded entity's EIN. If the LLC is classified as a corporation or partnership, enter the entity's EIN.

Note: See *What Name and Number To Give the Requester,* later, for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local SSA office or get this form online at *www.SSA.gov*. You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at *www.irs.gov/Businesses* and clicking on Employer Identification Number (EIN) under Starting a Business. Go to *www.irs.gov/Forms* to view, download, or print Form W-7 and/or Form SS-4. Or, you can go to *www.irs.gov/OrderForms* to place an order and have Form W-7 and/or SS-4 mailed to you within 10 business days.

If you are asked to complete Form W-9 but do not have a TIN, apply for a TIN and write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note: Entering "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon.

Caution: A disregarded U.S. entity that has a foreign owner must use the appropriate Form W-8.

Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if item 1, 4, or 5 below indicates otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). In the case of a disregarded entity, the person identified on line 1 must sign. Exempt payees, see *Exempt payee code,* earlier.

Signature requirements. Complete the certification as indicated in items 1 through 5 below.

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983. You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983. You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

3. Real estate transactions. You must sign the certification. You may cross out item 2 of the certification.

4. Other payments. You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments made in settlement of payment card and third party network transactions, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), ABLE accounts (under section 529A), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions. You must give your correct TIN, but you do not have to sign the certification.

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account) other than an account maintained by an FFI	The actual owner of the account or, if combined funds, the first individual on the account[1]
3. Two or more U.S. persons (joint account maintained by an FFI)	Each holder of the account
4. Custodial account of a minor (Uniform Gift to Minors Act)	The minor[2]
5. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee[1]
b. So-called trust account that is not a legal or valid trust under state law	The actual owner[1]
6. Sole proprietorship or disregarded entity owned by an individual	The owner[3]
7. Grantor trust filing under Optional Form 1099 Filing Method 1 (see Regulations section 1.671-4(b)(2)(i)(A))	The grantor*
For this type of account:	**Give name and EIN of:**
8. Disregarded entity not owned by an individual	The owner
9. A valid trust, estate, or pension trust	Legal entity[4]
10. Corporation or LLC electing corporate status on Form 8832 or Form 2553	The corporation
11. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
12. Partnership or multi-member LLC	The partnership
13. A broker or registered nominee	The broker or nominee
14. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity
15. Grantor trust filing under the Form 1041 Filing Method or the Optional Form 1099 Filing Method 2 (see Regulations section 1.671-4(b)(2)(i)(B))	The trust

[1] List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

[2] Circle the minor's name and furnish the minor's SSN.

[3] You must show your individual name and you may also enter your business or DBA name on the "Business name/disregarded entity" name line. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

[4] List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.) Also see *Special rules for partnerships,* earlier.

***Note:** The grantor also must provide a Form W-9 to trustee of trust.

Note: If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

Secure Your Tax Records From Identity Theft

Identity theft occurs when someone uses your personal information such as your name, SSN, or other identifying information, without your permission, to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax preparer.

If your tax records are affected by identity theft and you receive a notice from the IRS, respond right away to the name and phone number printed on the IRS notice or letter.

If your tax records are not currently affected by identity theft but you think you are at risk due to a lost or stolen purse or wallet, questionable credit card activity or credit report, contact the IRS Identity Theft Hotline at 1-800-908-4490 or submit Form 14039.

For more information, see Pub. 5027, Identity Theft Information for Taxpayers.

Victims of identity theft who are experiencing economic harm or a systemic problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 1-877-777-4778 or TTY/TDD 1-800-829-4059.

Protect yourself from suspicious emails or phishing schemes. Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to *phishing@irs.gov*. You may also report misuse of the IRS name, logo, or other IRS property to the Treasury Inspector General for Tax Administration (TIGTA) at 1-800-366-4484. You can forward suspicious emails to the Federal Trade Commission at *spam@uce.gov* or report them at *www.ftc.gov/complaint*. You can contact the FTC at *www.ftc.gov/idtheft* or 877-IDTHEFT (877-438-4338). If you have been the victim of identity theft, see *www.IdentityTheft.gov* and Pub. 5027.

Visit *www.irs.gov/IdentityTheft* to learn more about identity theft and how to reduce your risk.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons (including federal agencies) who are required to file information returns with the IRS to report interest, dividends, or certain other income paid to you; mortgage interest you paid; the acquisition or abandonment of secured property; the cancellation of debt; or contributions you made to an IRA, Archer MSA, or HSA. The person collecting this form uses the information on the form to file information returns with the IRS, reporting the above information. Routine uses of this information include giving it to the Department of Justice for civil and criminal litigation and to cities, states, the District of Columbia, and U.S. commonwealths and possessions for use in administering their laws. The information also may be disclosed to other countries under a treaty, to federal and state agencies to enforce civil and criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism. You must provide your TIN whether or not you are required to file a tax return. Under section 3406, payers must generally withhold a percentage of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to the payer. Certain penalties may also apply for providing false or fraudulent information.

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____ _____ as Principal, and _____ _____ as Surety, are hereby held and firmly bound unto _____ as Owner in the penal sum of _____ _____ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed this _____day of _____, 20____.

The Condition of the above obligation is such that whereas the Principal has submitted to _____ a certain BID, attached hereto and hereby made a part hereof to enter into a contract in writing, for the _____ _____.

_____.

NOW, THEREFORE,

(a) If said BID shall be rejected, or

(b) If said BID shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said BID) and shall furnish a BOND for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said BID, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the OWNER may accept such BID; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____
Principal

_____
Surety

BY: _____

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____ _____ as Principal, and _____ _____ as Surety, are hereby held and firmly bound unto _____ as Owner in the penal sum of _____ _____ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed this _____day of _____, 20____.

The Condition of the above obligation is such that whereas the Principal has submitted to _____ a certain BID, attached hereto and hereby made a part hereof to enter into a contract in writing, for the _____ _____.

_____.

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IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____
Principal

_____
Surety

BY: _____

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

COMPETITIVE SEALED BID NO. 19-001
EDINBURG NORTH PARK
EDINBURG, TEXAS

MS. NELDA RAMIREZ
DIRECTOR OF FINANCE
EDINBURG EEDC
415 W. UNIVERSITY DRIVE
EDINBURG, TEXAS 78541

The undersigned, as bidder(s), declares that the only person or parties interested in this bid as principals are those named herein, that this bid is made without collusion with any other person, firm or corporation; that he has carefully examined the Form of Contract, Notice to Bidder, General Conditions, Special Provisions, Measurement and Basis of Payment, specifications and the plans thereon referred to, and has carefully examined the locations, all conditions and classes of materials of the proposed work; and agrees that he will provide all the necessary labor, machinery, tools, and apparatus, and other items incidental to construction, and will do all the work and furnish all the materials called for in the contract and specifications in the manner prescribed therein and according to the requirements of the Engineer/Architect as therein set forth.

It is understood that the following quantities of work to be done at unit prices are approximate only and are intended principally to serve as guidance in evaluating bids.

It is further agreed that the quantities of work to be done at unit price and materials to be furnished, may be increased or diminished as may be considered necessary, in the opinion of the Engineer, to complete the work fully as planned and contemplated, and that all quantities of the work, whether increased or decreased, are to be performed at the unit prices set forth below except as provided for in the specifications.

It is further agreed that lump sum prices may be increased to cover additional work ordered by the Engineer, but not shown on the plans or required by the specifications, in accordance with the provisions of the General Conditions. Similarly, they may be decreased to cover deletion of work so ordered.

The 5% bid security accompanying this bid shall be returned to the bidder, unless in case of the acceptance of the bid the bidder shall fail to execute a contract and file a performance bond and payment bond within the ten (10) days after its acceptance, in which case the bid security shall become the property of the OWNER, and shall be considered as payment for damages due to delay and other inconveniences by the Owner on account of such failure of the bidder. It is understood that the Owner reserves the right to reject any and all bids.

BID PROPOSAL FORM
ORIGINAL BID PROPOSAL FORM MUST BE SUBMITTED ALONG WITH THE BID AND CONTRACT DOCUMENTS BOOKLET

BIDDERS BOND in the amount of $_____,(5%) of the greatest amount bid in compliance with the INSTRUCTION TO BIDDERS.

The above Cashier's Check or Bidder's Bond is to become the property of the OWNER, in the event the construction contract (when offered by the Owner) and bonds are not executed within the time set forth.

IMPORTANT NOTE:
For information regarding the method UNIT ITEMS are to be MEASURED AND PAID, please refer to the "MEASUREMENT AND BASIS OF PAYMENT" Section attached and made part of this Bid.

CONSTRUCTION PREPARATION

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
1.	1	LS	**Preparation of Project Limits/Demolition Plan for Entire Project Site**, including clearing, demolition, grubbing, tree and shrub removal, structure removal including all appurtenances, fence structures required to secure construction site, fine grading, including compaction, all necessary additional fills and cuts, hauling and spreading of select material to the limits indicated in the plans all complete in place per Lump Sum (LS) for	$_____	$_____
2.	1	LS	**Stormwater Pollution Prevention Plan (SWPPP) and Stormwater Permit (ALL AREAS)** as per City, State and Federal requirements, including permit/filing fee, required inspections, all complete for the term of the project per Lump Sum (LS) for	$_____	$_____
3.	1	LS	**Erosion Control Devices,** as per the Plans and specifications for the entire Project, including any additional BMP's required by SWPPP, all complete in place including maintenance/ removal after the Project is completed per Lump Sum (LS) for	$_____	$_____
4.	1	LS	**Traffic Control**, including signage, detours, flagmen, temporary drive installation, for project duration, all complete in place per Lump Sum (LS) for	$_____	$_____

TOTAL CONSTRUCTION PREPARATIONS: (Items 1-4) **$** _____

SPORTS FIELDS IMPROVEMENTS

FIELD IMPROVEMENTS – *All sports field areas are to meet the most current requirements within their league classification (i.e.,Little League, Pony League, etc.). Where any conflict between the plans and specifications and league specifications/guidelines arise, Contractor shall inform Engineer of conflicts and request approval PRIOR to making any changes or constructing improvements.*

BASKETBALL COURT IMPROVEMENTS

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
5.	1	EA	**Basketball Court,** construction, finished reinforced concrete surface, court striping, (basketball in-ground poles, backboards and netting to be provided by Owner, installation by Contractor),complete in place, in accordance with plans per Each (EA) for	$_____	$_____
6.	2	EA	**Trash Receptacle Installation,** bolted to ground, concrete pad/footing as required, including all materials, size, type specified, fixtures and equipment, (Trash receptacles to be provided by Owner, installation by Contractor) all complete and in place in accordance with plans and specifications per Each (EA) for	$_____	$_____
7.	2	LS	**Lights - Basketball Courts,** including installation, electrical conduit and wiring, hardware, trenching, pole and foundation, light extension, all permits and fees, as per MEP plans and specifications, all complete and in place per Lump Sum (LS)	$_____	$_____

TOTAL BASKETBALL COURT IMPROVEMENTS: (Items 5-7) **$_____**

SOFTBALL FIELD IMPROVEMENTS - (Sports Field Lighting to be purchased by Owner/installed by Manufacturer – Contractor responsible for coordination with Owner and lighting manufacturer.)

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
8.	1	EA	**Softball Field**, field construction including sports field hydromulch, infield and outfield drainage and preparation, removal of any rocks, infield mix, infield conditioner, sports field grading, top soil, and laser leveling, dugout construction, water hose bibs with locks, (bases, foul poles, dugout benches, and bleachers to be provided by Owner, installation by Contractor), coordination with MUSCO for the installation of lights, all complete in place in accordance with plans and specifications per Each (EA) for	$_____	$_____
9.	1	LS	**Chain Link Fencing, Backstop and Gates,** for heights and types specified an indicated, locking mechanisms, large sliding gates for maintenance access with locking mechanism, as per plans and specifications all complete in place per Lump Sum (LS) for	$_____	$_____

10.	1	LS	**Irrigation System,** as per plans and specifications, designed and installed by a licensed and registered irrigation professional, **(plans represent a schematic layout with minimum performance requirements)**, including System Controller, Vacuum Breaker, Control Valves, Irrigation Main, Laterals, Pop Up Heads, quick connects, and all other required components, all complete and in place per Lump Sum (LS) for	$_____	$_____
11.	4	EA	**Bleacher Seating Assembly and Installation,** (50 person capacity each), (bleachers to be provided by Owner, installation by Contractor), assemble bleachers, bolt down to concrete with area between both bleachers for 2 handicap spots with chain link fencing and signage, all as per plans and specifications, all complete in place per Each (EA) for	$_____	$_____
12.	1	EA	**Score Keeper's Crows Nest,** including ladder, railing, shade canopy, weather resistant scoring desk, electrical plug connection, concrete foundation, stairs, all complete in place in accordance with plans and specifications per Each (EA) for	$_____	$_____
13.	1	EA	**Scoreboard Installation,** including electrical connection from source, conduit and wiring, concrete foundation, poles, all materials, labor and equipment and any other miscellaneous appurtenances, (Scoreboard and score keeper will be provided by Owner. Installation by Contractor) all complete in place in accordance with plans and specifications per Each (EA) for	$_____	$_____
14.	1	EA	**30-Foot Aluminum Flag Pole,** as per plans and specifications including concrete foundation, and flag pole, all complete in place per Each (EA) for	$_____	$_____
15.	4	EA	**Trash Receptacle Installation,** bolted to ground, concrete pad/footing as required, including all materials, size, type specified, fixtures and equipment, (Trash receptacles to be provided by Owner, installation by Contractor) all complete and in place in accordance with plans and specifications per Each (EA) for	$_____	$_____

TOTAL SOFTBALL FIELD IMPROVEMENTS: (Items 8-15) **$_____**

FOOTBALL PRACTICE FIELD IMPROVEMENTS

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
16.	1	LS	**Football Practice Field**, field construction including sports field seeding as specified on plans, fine grading, finished field surface, permanent corner markers, initial field striping, complete in place, in accordance with plans per Lump Sum (LS) for	$_____	$_____

17.	1	LS	**Irrigation System,** as per plans and specifications, designed and installed by a licensed and registered irrigation professional, **(plans represent a schematic layout with minimum performance requirements and should not be solely used to determine a bid amount)**, including System Controller, Vacuum Breaker, Control Valves, Irrigation Main, Laterals, Pop Up Heads, quick connects, and all other required components, all complete and in place per Lump Sum (LS) for	$_____	$_____

TOTAL FOOTBALL PRACTICE FIELD IMPROVEMENTS: (Item 16-17) **$** _____

WALKING/JOGGING TRAIL IMPROVEMENTS

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
18.	1,230	SY	**Decomposed Granite 8-Foot Walking Trail,** 4" thick**,** for type and gradation specified, including 2" compacted flexible base, labor, equipment, materials, and appurtenances, as per plans and specifications, all complete and in place per Square Yard (SY) for	$_____	$_____
19.	2,730	LF	**Reinforced Concrete Trail Edging (6"x 6"),** including 2" compacted caliche base, 3000 psi concrete, formwork, reinforcing steel, all labor, equipment and material as per plans and specifications, all complete in place per Linear Feet (LF) for	$_____	$_____
20.	3	EA	**Park Bench Assembly and Installation,** bolted to ground including all materials, fixtures and equipment, concrete pad as required, (park benches to be provided by Owner, installation by Contractor) in accordance with plans and specifications all complete in place per Each (EA) for	$_____	$_____
21.	16	EA	**Lights – Walking Trail -** poles, fixtures, materials and labor, concrete foundation, electrical conduit, wiring from source, connection to panel board, and any other miscellaneous items, all complete in place, in accordance with MEP plans and specifications per Each (EA.) for	$_____	$_____
22.	3	EA	**Trash Receptacle Installation,** bolted to ground, concrete pad/footing as required, including all materials, size, type specified, fixtures and equipment, (trash receptacles to be provided by Owner, installation by Contractor) all complete and in place in accordance with plans and specifications per Each (EA) for	$_____	$_____

TOTAL WALKING/JOGGING TRAIL IMPROVEMENTS: (Items 18-22) **$**_____

PLAYSCAPE AND BBQ AREA IMPROVEMENTS

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
23.	1	LS	**Playscape Structure Base Preparation,** (Structure and rubber padding to be provided by Owner and installed by manufacturer, Site preparation including material and installation of 4" compacted flexible base by Contractor, in accordance with the plans and specifications, complete in place per Lump Sum (LS) for	$_____	$_____
24.	60	LF	**Masonry Seating Wall,** as per plans and specifications all complete in place per Linear Foot (LF) for	$_____	$_____
25.	3,915	SF	**Reinforced Concrete Sidewalk (S-1),** 4" thick, including handicap ramps, joints and joint sealer, 2" sand base, grading, truncated domes according to ADA requirements, all as per the plans and specifications for the width shown, all complete in place per Square Foot (SF) for	$_____	$_____
26.	225	SF	**9-Foot Reinforced Concrete Connection Sidewalk (S-2),** 4" thick, including handicap ramps, joints and joint sealer, 2" sand base, grading, truncated domes according to ADA requirements, all as per the plans and specifications for the width shown, all complete in place per Square Foot (SF) for	$_____	$_____
27.	100	LF	**Reinforced Concrete Curb,** as per plans and specifications, all complete in place per Linear Foot (LF) for	$_____	$_____
28.	2	EA	**Picnic Canopies,** as per plans and specifications, including concrete foundation, electrical lighting as per MEP plans and specifications, conduit wiring from source, all complete in place per Each (EA) for	$_____	$_____
29.	5	EA	**Picnic Table Assembly and Installation (Regular and ADA),** (Tables to be provided by Owner. Installation by Contractor) bolted to ground including all materials, fixtures and equipment, in accordance with plans and specifications all complete in place per Each (EA) for	$_____	$_____
30.	2	EA	**Stationary BBQ Pit Installation (Regular and ADA),** (Pits to be provided by Owner. Installation by Contractor) bolted to ground concrete pads/footing as required, all materials, fixtures and equipment, in accordance with plans and specifications all complete in place per Each (EA) for	$_____	$_____
31.	3	EA	**Trash Receptacle Installation,** bolted to ground, concrete pad/footing as required, including all materials, size, type specified, fixtures and equipment, (trash receptacles to be provided by Owner, installation by contractor), all complete and in place in accordance with plans and specifications per Each (EA) for	$_____	$_____

32.	1	LS	**Irrigation System,** as per plans and specifications, designed and installed by a licensed and registered irrigation professional, **(plans represent a schematic layout with minimum performance requirements and should not be solely used to determine a bid amount)**, including System Controller, Vacuum Breaker, Control Valves, Irrigation Main, Laterals, Pop Up Heads, and quick connects, hose bibs with locks, and all other required components, all complete and in place per Lump Sum (LS) for	$_____	$_____
33.	1	EA	**Pedestal Drinking Fountain (Non-Refrigerated),** as per plans and specifications, including all piping and connection to water source, all complete in place per Each (EA) for	$_____	$_____

TOTAL PLAYSCAPE AND BBQ AREA IMPROVEMENTS: (Item 23-33) **$** _____

SPLASH PAD PRELIMINARY IMPROVEMENTS

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
34.	1	LS	**Stub out and Conduit for Electrical (3 Phase 220) to future Equipment Room,** coordination with splash park installer, constructed as per the plans and specifications, all complete in place per Lump Sum (LS) for	$_____	$_____
35.	1	LS	**Stub out for Water Connection,** installation as shown on the plans and specifications coordination with splash park installer and City of Edinburg, water meter, and backflow preventer, all fees and permits, all complete in place per Lump Sum (LS) for	$_____	$_____
36.	1	LS	**Stub out for sewer connection,** installation as shown on the plans and specifications coordination with splash park installer and City of Edinburg, all complete in place per Lump Sum (LS) for	$_____	$_____

TOTAL SPLASH PAD PRELIMINARY IMPROVEMENTS: (Items 34-36) **$** _____

LANDSCAPING AND GENERAL IRRIGATION

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
37.	1	LS	**Landscaping,** as per plans and specifications, including any trees, plants, shrubs, mulch, hydromulching of general areas, drip irrigation system, all complete in place per Lump Sum (LS) for	$_____	$_____

38.	1	LS	**Irrigation System and Drip Irrigation System (General Site, not covered by other bid items),** as per plans and specifications, designed and installed by a licensed and registered irrigation professional, **(plans represent a schematic layout with minimum performance requirements and should not be solely used to determine a bid amount)**, including System Controller, Vacuum Breaker, Control Valves, Irrigation Main, Laterals, Pop Up Heads, and quick connects, hose bibs with locks, all complete and in place per Lump Sum (LS) for	$_____	$_____

TOTAL LANDSCAPING AND GENERAL IRRIGATION: (Items 37-38) **$ _____**

CONCESSION STAND, RESTROOMS AND STORAGE

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
39.	1	LS	**Concession Stands with Restrooms, Family Bathroom, and Storage Room ,** as per plans and specifications, masonry walls, concrete foundation, roofing, all electrical and plumbing including sink, exterior hose bibs with lock, floor drains, water closets, mop sink, urinals, mirrors, electric hand dryers, commercial toilet paper dispenser, handicap changing table for family bathroom, toilet compartment doors, hardware, lower cabinets, demand hot water heater, all piping and fittings, electrical fixtures, connect to electrical and water source, all permits and fees, including all appurtenances, all complete in place per Lump Sum (LS) for	$_____	$_____
40.	2	EA	**Trash Receptacles** bolted to ground, concrete pad/footing as required, including all materials, size, type specified, fixtures and equipment, (trash receptacles to be provided by Owner, installation by Contractor) all complete and in place in accordance with plans and specifications per Each (EA) for	$_____	$_____
41.	1	EA	**Cooled Drinking Fountain with Water Bottle Filler,** as per plans and specifications, including water and electrical connection, all complete in place per Each (EA) for	$_____	$_____
42.	215	LF	**2-Inch Domestic Service,** service line from water meter to building, line installation and fittings, backflow preventer, as per plans and COE standards, all complete in place per Linear Foot (LF) for	$_____	$_____
43.	550	LF	**4-inch Sanitary Sewer Service with 3 Cleanouts**, Schedule 40, installed as per plans and City of Edinburg standards, all complete and in place per Linear Foot (LF) for	$_____	$_____

44.	1	EA	**32" x 24" Bronze Plaque Installation,** rear mount style (Bronze plaque to be provided by Owner, installed by Contractor), all complete in place per Each (EA) for	$_____	$_____
45.	1	EA	**48" Fiberglass Sanitary Sewer Manhole**, grade rings, manhole ring, & cover, installed as per plans and City of Edinburg standards, including backfill and compaction, all complete in place per Each (EA) for	$_____	$_____

TOTAL CONCESSION STANDS WITH RESTROOMS: (Items 39-45) **$ _____**

GENERAL SITE IMPROVEMENTS

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
46.	1	LS	**Domestic Service Connection,** including tapping connection to water line, permit fees and meter costs, coordination with City of Edinburg, as per plans and COE standards, all complete in place per Lump Sum (LS) for	$_____	$_____
47.	1	LS	**Irrigation Service Connection,** including line installation and connection, backflow preventer coordination with City of Edinburg, as per plans and COE standards, all complete and in place per Lump Sum (LS) for	$_____	$_____
48.	600	LF	**6' Chain Link Fence,** installed as shown on the plans and specifications, all complete in place per Linear Feet (LF) for	$_____	$_____
49.	1	LS	**Electrical Panel Area,** including concrete pad, 6' chain link fence and gate with locking mechanism, planting of bushes around perimeter that will grow to hide area, including drip system for watering all complete in place per lump sum (LS) for	$_____	$_____
50.	1	LS	**Electrical Service Connection Allowance –** From selected electrical provider, including transformers, lines, any appurtenances, additional fees and permits. Subject to the Owner's authorization and written approval of the final amount paid, determined by Magic Valley Electric's Invoice, which shall not include any markups, profit, or service fees by the contractor, all complete in place per Lump Sum (LS) for	$30,000	$30,000
51.	1	LS	**Electrical Service – Contractor,** including trenching, conduit and transformer pad, coordination with electrical provider, and any other appurtenances all complete in place per Lump Sum (LS) for	$_____	$_____

52.	3	EA	**General Area Lights (Along Main Walkway),** including poles, fixtures, materials and labor, concrete foundation, electrical conduit, wiring from source, connection to panel board, and any other miscellaneous items, all complete in place, in accordance with MEP plans and specifications per Each (EA.) for	$_____	$_____
53.	1	LS	**Dumpster Enclosure,** as per plans and specifications including concrete pad, side walls and front rolling, locking gate, safety bollards, as shown on the plans and specifications, all complete and in place per Lump Sum (LS) for	$_____	$_____

TOTAL GENERAL SITE IMPROVEMENTS: (Items 46-53) **$ _____**

SIDEWALK AND WALKWAY IMPROVEMENTS

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
54.	5,430	SF	**Reinforced Concrete Sidewalk – Main Walkway and Softball Area (S-3),** 4" thick, including handicap ramps, concrete curb at handicap ramps, joints and joint sealer, 2" sand base, grading, truncated domes according to ADA requirements, all as per the plans and specifications for the width shown, all complete in place per Square Foot (SF) for	$_____	$_____
55.	920	SF	**Reinforced Concrete Sidewalk – Bathroom and Concession (S-4),** 4" thick, including handicap ramps, concrete curb at handicap ramps, joints and joint sealer, 2" sand base, grading, truncated domes according to ADA requirements, all as per the plans and specifications for the width shown, all complete in place per Square Foot (SF) for	$_____	$_____
56.	880	SF	**Reinforced Concrete Sidewalk – East/West Connection (S-5),** 4" thick, including handicap ramps, concrete curb at handicap ramps, joints and joint sealer, 2" sand base, grading, truncated domes according to ADA requirements, all as per the plans and specifications for the width shown, all complete in place per Square Foot (SF) for	$_____	$_____
57.	2,000	SF	**Reinforced Concrete Sidewalk – Parking Lot (S-6),** 4" thick, including handicap ramps, concrete curb at handicap ramps, joints and joint sealer, 2" sand base, grading, truncated domes according to ADA requirements, all as per the plans and specifications for the width shown, all complete in place per Square Foot (SF) for	$_____	$_____
58.	7,670	SF	**5' Reinforced Concrete Sidewalk – Perimeter Sidewalk (S-7),** 4" thick, including handicap ramps, concrete curb at handicap ramps, joints and joint sealer, 2" sand base, grading, truncated domes according to ADA requirements, all as per the plans and specifications for the width shown, all complete in place per Square Foot (SF) for	$_____	$_____

TOTAL SIDEWALK/WALKWAY IMPROVEMENTS: (Item 54-58) **$** _____

PARKING LOT PAVING IMPROVEMENTS

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
59.	2,275	SY	**6" Compacted Lime Treated Subgrade**, with lime (3% lime by weight), compacted as per plans and specifications, conforming to TX-DOT 2004 Standard Specification Item 260, complete and in place per Square Yard (SY) for	$_____	$_____
60.	2,275	SY	**8" Compacted Flexible Base**, Type "E" Grade 4, compacted as per plans and specifications, conforming to TX-DOT 2004 Standard Specification Item 247, complete and in place per Square Yard (SY) for	$_____	$_____
61.	1,975	SY	**2" Compacted Hot-Mix Asphaltic Concrete**, Type "D" surface course conforming to TX-DOT 2004 Standard Specification Item 340, including MC-30 Prime Coat, and Tack Coat, all complete in place per Square Yard (SY) for	$_____	$_____
62.	785	LF	**18" Concrete Curb and Gutter,** as per plans and specifications, all complete and in place per Linear Foot (LF) for	$_____	$_____
63.	125	LF	**Laydown Curb,** as per plans and specifications, all complete and in place per Linear Foot (LF) for	$_____	$_____
64.	2	EA	**Lighting** as per MEP plans and specifications for general areas including lighting fixture, pole, concrete foundation, all wiring from source, all complete and in place per Each (EA) for	$_____	$_____
65.	1	EA	**Bike Rack,** (Bike Rack to be provided by Owner. Installation by Contractor) including concrete foundation, bolted to ground all complete in place, including painting if necessary, in accordance with plans and specifications per Each (EA) for	$_____	$_____
66.	1	LS	**Thermoplastic Pavement Striping / Markings and Signage (WHITE thermoplastic),** including directional arrows and parking lot striping, signage assemblies as shown, (26) concrete wheel stops as indicated in the plans and specifications, all complete and in place per Lump Sum (LS) for	$_____	$_____

TOTAL PARKING LOT PAVING IMPROVEMENTS: (Items 59-66)**$** _____

DRAINAGE IMPROVEMENTS

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
67.	430	LF	**15" RCP, Class III,** all depths, "Rubber Gasket" joints, backfill, compaction, all connections, installed as per plans and specifications, all complete and in place per Linear Foot (LF) for	$_____	$_____

68.	9	EA	**Cast in Place Reinforced Concrete Safety End Treatments**, installed as per the plans and specifications, complete in place per Each (EA) for	$_____	$_____
69.	2	EA	**4'x4' Type C Grate Inlet,** installed as per the plans and specifications, complete in place per Each (EA) for	$_____	$_____
70.	200	LF	**8" Bleeder Line,** installed connection to TxDOT drainage system as shown on the plans and specifications, complete in place per Linear Foot (LF)	$_____	$_____
71.	430	LF	**Trench Safety System,** for Storm Sewer Lines/Excavations as required, complete in place per Linear Foot (LF) for	$_____	$_____

TOTAL DRAINAGE IMPROVEMENTS: (Item 67-71) **$** _____

DRAINAGE MASTER PLAN

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
72.	1	LS	**Detention Area Construction,** as per the plans and specifications, including excavation, compaction, grading, gravel or bedding material, all complete in place per Lump Sum (LS) for	$_____	$_____
73.	1	LS	**Swales,** constructed as per the plans and specifications, grade to drain, including excavation, compaction, grading, all complete in place per Lump Sum (LS) for	$_____	$_____
74.	11	EA	**Sidewalk Drain Chutes,** 18" sidewalk steel plate, as per plans and specifications, all complete in place per Each (EA.) for	$_____	$_____

TOTAL DRAINAGE MASTER PLAN IMPROVEMENTS: (Items 72-74) **$**_____

MONUMENT SIGN – PRELIMINARY

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
75.	1	LS	**Stub out and Conduit for Electrical,** as per MEP plans and specifications, all complete in place per Lump Sum (LS) for	$_____	$_____
76.	1	LS	**Connection from Irrigation System and Stub Out for Future Drip Irrigation,** including connection from lines, piping, stub out, all complete in place ready for future drip irrigation system, all complete in place per Lump Sum (LS) for	$_____	$_____

TOTAL MONUMENT SIGN: (Items 75-76) **$**_____

PROJECT CONTINGENCY

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
77.	1	LS	**Contingency –** To be used for any additional items required for the Project, subject to the Owner's authorization and written approval of mutually	$50,000	$50,000.00

			agreed upon amounts prior to use, per Lump Sum (LS) for		

TOTAL CONTINGENCY: (Items 77) **$ 50,000.00**

TOTAL BASE BID IMPROVEMENTS: (Items 1-77) **$** _____

ADD ALTERNATES

ADD ALTERNATE NO 1 -SPLASH PARK IMPROVEMENTS

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
78.	1	LS	**16'X16' Maintenance/Equipment Room,** constructed as per the plans and specifications, all complete in place per Lump Sum (LS) for	$_____	$_____
79.	2	EA	**Trash Receptacle Installation,** bolted to ground, concrete pad/footing as required, including all materials, size, type specified, fixtures and equipment, (trash receptacles to be provided by Owner, installation by Contractor) all complete and in place in accordance with plans and specifications per Each (EA) for	$_____	$_____
80.	1	EA	**Lighting** as per MEP plans and specifications for general areas including lighting fixture, pole, concrete foundation, all wiring from source, all complete and in place per Each (EA) for	$_____	$_____
81.	490	SF	**Reinforced Concrete Sidewalk (S-8) – Splash Park,** 4" thick, joints and joint sealer, 2" sand base, grading, truncated domes according to ADA requirements, coordination with splash park installer, all as per the plans and specifications for the width shown, all complete in place per Square Foot (SF) for	$_____	$_____

ADD ALTERNATE NO. 1: (Items 78-81) **$**_____

ADD ALTERNATE NO 2 – FITNESS COURT

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
82.	1,535	SF	**Concrete Pad,** for the thickness and concrete strength specified as per the plans and specifications, all complete and in place per Square Feet (SF) for	$_____	$_____
83.	1	EA	**Lighting** as per MEP plans and specifications for general areas including lighting fixture, pole, concrete foundation, all wiring from source, all complete and in place per Each (EA) for	$_____	$_____
84.	1	LS	**Trash Receptacles** bolted to ground, concrete pad/footing as required, including all materials, size, type specified, fixtures and equipment, (trash receptacles to be provided by Owner, installation by Contractor) all complete and in place in	$_____	$_____

			accordance with plans and specifications per Lump Sum (LS) for		

ADD ALTERNATE NO. 2: (Items 82-84) **$**_____

ADD ALTERNATE NO. 3 - PARKING LOT 2 PAVING IMPROVEMENTS

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
85.	960	SY	**6" Compacted Lime Treated Subgrade**, with lime (3% lime by weight), compacted as per plans and specifications, conforming to TX-DOT 2004 Standard Specification Item 260, complete and in place per Square Yard (SY) for	$_____	$_____
86.	960	SY	**8" Compacted Flexible Base**, Type "E" Grade 4, compacted as per plans and specifications, conforming to TX-DOT 2004 Standard Specification Item 247, complete and in place per Square Yard (SY) for	$_____	$_____
87.	830	SY	**2" Compacted Hot-Mix Asphaltic Concrete**, Type "D" surface course conforming to TX-DOT 2004 Standard Specification Item 340, including MC-30 Prime Coat, and Tack Coat, all complete in place per Square Yard (SY) for	$_____	$_____
88.	332	LF	**18" Concrete Curb and Gutter,** as per plans and specifications, all complete and in place per Linear Foot (LF) for	$_____	$_____
89.	2	EA	**Lighting** as per MEP plans and specifications for general areas including lighting fixture, pole, concrete foundation, all wiring from source, all complete and in place per Each (EA) for	$_____	$_____
90.	1	LS	**Thermoplastic Pavement Striping / Markings and Signage (WHITE thermoplastic),** including directional arrows and parking lot striping, signage assemblies as shown, new concrete wheel stops as indicated in the plans and specifications, all complete and in place per Lump Sum (LS) for	$_____	$_____

ADD ALTERNATE NO 3: (Items 85-90)**$** _____

ADD ALTERNATE NO 4 – SKATE PARK IMPROVEMENTS (PART 1)

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
91.	1	LS	**Stub out and Conduit for Electrical,** as per MEP plans and specifications, all complete in place per Lump Sum (LS) for	$_____	$_____

ADD ALTERNATE NO. 4: (Item 91) **$**_____

ADD ALTERNATE NO. 5 - MONUMENT SIGN

Item No.	Estimated Quantity	Unit	Item Description	Unit Price	Total
92.	1	LS	**Monument Sign,** as shown on the plans and specifications, including concrete foundation, all complete in place per Lump Sum (LS) for	$_____	$_____
93.	1	LS	**Landscaping and Drip Irrigation System,** as shown on the plans and specifications, including all plants, top soil, plants, much, plastic weed control liner, and drip irrigation system, all complete in place per Lump Sum (LS) for	$_____	$_____
94.	2	EA	**Lighting** as per MEP plans and specifications for general areas including lighting fixture, pole, concrete foundation, all wiring from source, all complete and in place per Each (EA) for	$_____	$_____

TOTAL ADD ALTERNATE NO. 5 : (Item 92-94) **$ _____**

PROJECT GRAND TOTAL: (Items 1-94) $ _____

The undersigned agrees, unless hereinafter stated otherwise to furnish all materials as shown and specified in the Plans and Specifications.

Bidder hereby agrees to commence work under this contract within 10 days after "NOTICE TO PROCEED" is issued, and to complete all the work in the Contract within **270 Calendar Days**.

The undersigned bidder acknowledges the receipt of the following addenda:

ADDENDUM NO.	DATE	BY
ADDENDUM No. 1		
ADDENDUM No. 2		
ADDENDUM No. 3		
ADDENDUM No. 4		
ADDENDUM No. 5		
ADDENDUM No. 6		

DATE: _____

BY: _____
(Signature)

_____
(Type or Print Name)

_____
(Title)

_____
(Company)

_____
(Address)

_____
(City, State, Zip)

(Phone Number)

(Fax Number)

(Seal – If Bidder is a Corporation)

EXHIBIT "A" SUPPLEMENTAL INFORMATION

ITEM	SUPPLIER	ITEM NO.	PURCHASE	INSTALLATION	COMMENTS
Flagpoles	Eder-Flag, Inc.	320449 or 320453	CONTRACTOR	CONTRACTOR	Or Approved Equal
Bronze Plaque	A.K. Ramos	32" x 24" - back mount	OWNER	CONTRACTOR	
Bike Rack	Global Industries	652779MBL	OWNER	CONTRACTOR	
Benches	Global Industries	277155BL	OWNER	CONTRACTOR	
Aluminum Picnic Tables (Reg and ADA)	Global Industries	277152BL and 695289BKL	OWNER	CONTRACTOR	
Rotating Flipback Grills (Reg and ADA)	Global Industries	294026 and 249027	OWNER	CONTRACTOR	
Trash Receptacles	Global Industries	261924BL	OWNER	CONTRACTOR	
Drinking Fountain - Pedestal	HAWS	HAWS3300G	CONTRACTOR	CONTRACTOR	Or Approved Equal
Drinking Fountains - wall mounted	ELKAY	VRCTL8WSK	CONTRACTOR	CONTRACTOR	Or Approved Equal
Soap Dispenser	Contractor's Choice	Approved by Engineer	CONTRACTOR	CONTRACTOR	
Bathroom Tissue Dispenser	Contractor's Choice	Approved by Engineer	CONTRACTOR	CONTRACTOR	
Electric Hand Dryers	Bobrick	B-750 Recessed Hand Dryer	CONTRACTOR	CONTRACTOR	Or Approved Equal
Other Concession & Bathroom Fixtures	Contractor's Choice	Approved by Engineer	CONTRACTOR	CONTRACTOR	
BASKETBALL COURT					
Adjustable Post System Basketball Hoops	BSN	PR50059	OWNER	CONTRACTOR	
SOFTBALL FIELD					
Score Board	BSN	MCSBBS86	OWNER	CONTRACTOR	
Score Keeper	BSN	MSBREM1	OWNER	CONTRACTOR	
Score Keeper Battery	BSN	MSBPP4	OWNER	CONTRACTOR	
Varsity 15' Foul Pole	BSN	BSFOUL15	OWNER	CONTRACTOR	
21' Dugout Bench with Shelf	BSN	BEPS21	OWNER	CONTRACTOR	
Wood Filled Home Plate	BSN	BBHPSAFE	OWNER	CONTRACTOR	
MacGreggor Double First Base	BSN	1274127	OWNER	CONTRACTOR	
Youth League Pitching Mound	BSN	MP3003	OWNER	CONTRACTOR	
Major League Bases with Anchors	BSN	1055412	OWNER	CONTRACTOR	
Big League Base Plugs	BSN	BBBLPLUGPK	OWNER	CONTRACTOR	
Base Anchor Foundation Set	BSN	1269895	OWNER	CONTRACTOR	
Official Size Pitcher's Plate	BSN	BBPPLATE	OWNER	CONTRACTOR	
Backstops	Chain Link Fencing	Approved by Engineer	CONTRACTOR	CONTRACTOR	
Bleachers	Global Industries	T97277155BL	OWNER	CONTRACTOR	
PLAYSCAPE					
ParkPlace Kids Choice	Park Place	PENDING	OWNER	MIRACLE	BASE BY CONTRACTOR

ITEM	SUPPLIER	ITEM NO.	PURCHASE	INSTALLATION	COMMENTS
LIGHTING					
Baseball and Softball Fields	MUSCO	As per plans	OWNER	MUSCO	
All other Lighting	As per plans	As per plans	CONTRACTOR	CONTRACTOR	
WATER SPLASH PARK					
Splash Park	Park Place	Pending	OWNER	PARK PLACE	
Equipment Room	As per plans	As per Plans	CONTRACTOR	CONTRACTOR	

MEASUREMENT AND BASIS OF PAYMENT

1.00 GENERAL

IT IS THE INTENT OF THIS CONTRACT TO COVER ALL THE WORK TO BE PERFORMED SUBSIDIARY TO ALL THE ITEMS INCLUDED IN THE BID AND SUCH PRICES SHALL BE BALANCED INDIVIDUALLY AND SHALL INCLUDE FURNISHING ALL MATERIALS, SUPERINTENDENCY, SUPERVISION, CONSTRUCTION SURVEYING AND LAYOUT, LABOR, INSURANCE, BONDS, BENEFITS, MACHINERY, FUEL, VEHICLES, SAFETY EQUIPMENT, ADMINISTRATIVE COSTS, QUALITY CONTROL, GUARANTEES AND WARRANTIES, OVERHEAD, AND ALL INCIDENTALS FOR COMPLETING THE ASSIGNED WORK IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS COMPLETE IN PLACE. ***IN CASE THE FOLLOWING MEASUREMENT AND BASIS OF PAYMENT DESCRIPTIONS CONFLICT WITH THE CORRESPONDING DESCRIPTIONS CONTAINED WITHIN THE TECHNICAL SPECIFICATIONS FOR THIS PROJECT, THE FOLLOWING DESCRIPTIONS SHALL GOVERN.***

THE FOLLOWING APPLICABLE ITEMS SHALL BE CONSIDERED AS PAY ITEMS. ALL OTHER WORK NOT SPECIFICALLY LISTED OR INDICATED BELOW SHALL BE SUBSIDIARY TO THE OVERALL COST OF THE PROJECT. ALL EXCAVATION IS UNCLASSIFIED.

GENERAL SITE IMPROVEMENTS

1. **PREPARATION OF PROJECT LIMITS/DEMOLITION PLAN FOR ENTIRE PROJECT SITE:** When called for in the proposal, shall be measured and paid from per LUMP SUM (L.S.), which includes outside all construction areas for the entire project and shall include all clearing and grubbing, demolition, removal and disposal of unsuitable material such as asphalt, organic materials, stripping of underlying soil, excavation, and fine grading, filling and compaction, cutting down to subgrade depth, disposal of debris and other material deemed not suitable for filling, hauling in fill material as required, all complete in place. Any material deemed salvageable by the Owner or Engineer shall be carefully removed and hauled to a designated location as directed by the Owner or Engineer, with such cost being subsidiary to this item.

2. **STORMWATER POLLUTION PREVENTION PLAN (SWPPP) AND STORMWATER PERMIT:** When called for in the proposal, shall be measured and paid per LUMP SUM (L.S.), and shall include all necessary plan preparation as required by the City, County, State and Federal guidelines. Plan shall include, but not be limited to, Site Evaluation, Assessment,

Planning, Erosion and Sediment Control Best Management Practices (BMPs), Post Construction BMPs, Inspections, Recordkeeping and Training and Final Stabilization. Plan must be submitted and approved by appropriate regulatory agency and shall include preparation and filings of Notice of Intent (NOI), Notice of Change (NOC) and Notice of Termination (NOT).

3. **EROSION CONTROL DEVICES:** When called for in the proposal, shall be measured and paid per LUMP SUM (L.S.), and shall include all necessary installation and removal of devices such as construction Entrances/Exits, silt fences, inlet sediment control screens, maintenance and replacement of erosion control devices throughout construction, and in accordance with requirements under the Stormwater Pollution Prevention Plan (SWPPP).

4. **BARRICADES, SIGNS AND TRAFFIC CONTROL:** When called for in the proposal, shall be measured and paid per LUMP SUM (L.S.), and shall include all necessary materials, labor, barricades, flagmen and construction signs as required in the Traffic Control Plan including all necessary regular inspection and maintenance of barricades and signage all in accordance with the plans and in conformance the Texas Department of Transportation Permit Instructions including all necessary traffic control for temporary road closures as approved by the City of Edinburg for installation of underground facilities, all in accordance with the UNIFORM TRAFFIC CODE, all complete in place.

BASKETBALL COURTS

5. **BASKETBALL COURT:** When called for in the proposal, shall be paid for EACH (E.A.), including reinforced concrete foundation, painting of regulation white textured basketball lines with three point arcs, (basketball in-ground poles, backboards and netting to be provided by Owner, installation by Contractor), all complete in place.

6. **TRASH RECEPTACLE INSTALLATION:** When called for in the proposal, shall be measured and paid per EACH (EA.), including bolted to ground, concrete pad as required, including all materials, size, type specified, fixtures and equipment, all complete and in place

7. **LIGHTS – BASKETBALL COURT:** When called for in the proposal, shall be paid for LUMP SUM (L.S.) for the height, brand and type specified in the plans and shall include all necessary materials, labor, equipment and installation, including foundation installation, conduit, trenching, wiring,

light fixtures, connection to lighting control panel, in accordance with plans and specifications, all complete in place.

SOFTBALL FIELD

8. **SOFTBALL FIELD:** When called for in the proposal, shall be paid for EACH (EA.), for the class and size of field indicated, shall include all labor, materials, and equipment to achieve proper drainage including fine grading and leveling, removal of any rocks or other foreign materials, hauling of fill material and addition of top soil as required, smoothing, laser leveling, construction of crown and contours, addition of soil conditioners, outfield and infield drainage, infield mix, infield conditioner, sports field hydro mulch, dugouts, hose bibs with locks, (bases, foul poles, backstop safety netting, dugout benches, and fence padding to be provided by Owner, installation by Contractor). Any items not specifically noted herein including any other appurtenances required for a finished product shall be provided and installed by the Contractor.

9. **CHAIN LINK FENCING, BACKSTOP AND GATES:** When called out in the proposal shall be paid for LUMP SUM (L.S.), for the type and height called out in the plans, and shall include all labor, materials, and gates with locking mechanisms, equipment and incidentals necessary in accordance with the plans and specification documents, and per the direction of the Engineer/Owner.

10. **IRRIGATION SYSTEM/DRIP IRRIGATION SYSTEM:** When called for in the proposal shall be paid for as Lump Sum (L.S.) designed by a licensed and registered irrigation professional (plans provided within bid package are for schematic purposes only. A Landscape Professional should design the irrigation system taking into account what will be required to water the complete **area shown** on the plans **PRIOR TO BIDDING**.), for all the work according to the submitted and approved plans and specs, and shall include all necessary pipe and hoses of the diameter and type specified for the specified location, all necessary fittings, air relief ball valves, Controllers, pressure vacuum Breaker, Electric Remote Control Valves, adaptors, demolition of existing lines (if any), all complete in place.

11. **BLEACHER SEATING ASSEMBLY AND INSTALLATION:** When called for in the proposal, shall be measured and paid per EACH (EA.) installed, (bleachers to be provided by Owner, installation by Contractor), and shall include assembling and installation of aluminum bleachers, tying down to concrete pad, reinforced concrete pad of thickness, and size

specified, as shown on plans and specification including all appurtenances.

12. **SCORE KEEPER'S CROWS NEST:** When called for in the proposal, shall be measured and paid per EACH (EA.), and shall include concrete foundation, shade canopy, scoring desk area, electrical plug connection, stairs as per plans and specifications including all appurtenances.

13. **SCOREBOARD INSTALLATION:** When called for in the proposal, shall be measured and paid per EACH (EA.), for installation, and shall include electrical connection from source, conduit and wiring, concrete foundation, poles, all materials, labor and equipment and any other miscellaneous items (Scoreboard and score keeper will be provided by Owner, Installation by Contractor), all complete in place in accordance with plans and specifications and manufacturer's recommendations.

14. **FLAG POLE:** When called for in the proposal, shall be measured and paid per EACH (EA.), including concrete foundation, flag pole, all materials, labor and equipment and installation, all complete in place as per plans and specifications.

15. **TRASH RECEPTACLE INSTALLATION:** When called for in the proposal, shall be measured and paid per EACH (EA.), including bolted to ground, concrete pad as required, including all materials, size, type specified, fixtures and equipment, all complete and in place

FOOTBALL PRACTICE FIELD

16. **FOOTBALL PRACTICE FIELD:** When called for in the proposal, shall be measured and paid for the project limits of fields as shown on plans per LUMP SUM (LS), and shall include stripping of underlying soil, excavation, and fine grading, filling and compaction, hauling in fill material as required, seeding and temporary watering, first field striping, permanent corner markers, finished field surface, all complete in place.

17. **IRRIGATION SYSTEM:** When called for in the proposal shall be paid for as Lump Sum (L.S.) designed by a licensed and registered irrigation professional (plans are for schematic purposes only), for all the work according to the submitted and approved plans by the irrigation professional, and shall include all necessary pipe and hoses of the diameter and type specified for the specified location, and all

necessary fittings, air relief ball valves, Controller, pressure vacuum Breaker, Electric Remote Control Valves, adaptors, demolition of existing lines, all complete in place.

WALKING/JOGGING TRAIL

18. **DECOMPOSED GRANITE WALKING TRAIL:** When called for in the proposal, shall be measured and paid per SQUARE YARD (SY.), for the **constructed length and width laid in accordance with Typical Details**, and shall include compacted flexible base material of type specified, decomposed granite material for thickness, width, type and gradation specified, bedding and base material, compacted, installed as per requirements of plans and specification, all complete in place.

19. **REINFORCED CONCRETE TRAIL EDGING:** When called for in the proposal, shall be measured and paid per LINEAR FOOT (LF.), for the **constructed length and width laid in accordance with Typical Details** and shall include all concrete form work, concrete material, bedding material, reinforcing steel (if necessary), installation, of size, type and strength specified, all complete in place as shown on plans and specifications.

20. **PARK BENCH ASSEMBLY AND INSTALLATION:** When called for in the proposal, shall be measured and paid per EACH (EA.) including installation of concrete pad, bolting to pad, for the type and quantity specified on the plans and specifications all complete in place.

21. **LIGHTS – WALKING TRAIL:** When called for in the proposal, shall be paid for EACH (EA.) for the height, brand and type specified in the plans and shall include all necessary materials, labor, equipment and installation, including foundation installation, conduit, trenching and pavement repair, wiring, light fixtures, connection to lighting control panel, in accordance with plans and specifications, all complete in place.

22. **TRASH RECEPTACLE INSTALLATION:** When called for in the proposal, shall be measured and paid per EACH (EA.), (trash receptacles to be provided by Owner, installation by Contractor) including bolted to ground, concrete pad as required, including all materials, size, type specified, fixtures and equipment, all complete and in place.

PLAYSCAPE AND BBQ AREA

23. **PLAYSCAPE STRUCTURE BASE PREPARATION:** When called for in the proposal, shall be measure and paid per LUMP SUM (L.S.) for the preparation of subgrade as specified on the plans and specifications, for the thickness and material specified. Playscape structure to be provided by Owner. Installation of playscape and rubber matting by Supplier.

24. **MASONRY SEATING WALL:** When called for in the proposal, shall be measured and paid per LINEAR FOOT (L.F.), for the constructed length, width, height and type specified on the plans and specifications, including all materials, equipment, and labor all complete in place.

25. **REINFORCED CONCRETE SIDEWALKS:** When called for in the proposal, shall be measured and paid per SQUARE FOOT (S.F.) for the **constructed length and width laid in accordance with Typical Details**, for the TYPE AND THICKNESS SPECIFIED, and shall include handicap ramps, and all necessary labor, excavation, backfilling, steel reinforcement, concrete of the strength specified, Compacted Subgrade as shown, Sand Cushion, seal-tight jointing material, concrete finish specified, as shown in the plans and specifications, including pre-fabricated truncated domes, ADA required color, all complete in place. ***(Wings and connections to sidewalk ramps must comply with Texas Accessibility Standards (TAS) Requirements)***.

26. **REINFORCED CONCRETE CURB**: When called for in the proposal, shall be measured and paid along the gutter line for catch, laydown or spills section, per LINEAL FOOT (L.F.), for the **constructed length in accordance with Typical Details**, measured with a surveyor's flat steel chain, for all Types indicated in the plans and specifications, and shall include all necessary labor, excavation, membrane curing compound, joints, backfilling, reinforcement, concrete of thickness and strength specified, as shown in the plans and specifications, all complete in place. **(*Concrete Curb and Gutter shall be laid over prepared base and subgrade as indicated in the typical sections. The prepared base and subgrade shall be considered subsidiary to this item).***

27. **PICNIC CANOPIES:** When called for in the proposal shall be measured and paid per EACH (EA.), and shall be constructed including concrete foundation, poles and roof canopy for the size, height and materials specified on the plans, lighting, extension of lighting from source, conduit installation, trenching and backfilling, and any other appurtenances, all complete and in place.

28. **PICNIC TABLE ASSEMBLY AND INSTALLATION (REGULAR AND ADA):** When called for in the proposal shall be measured and paid per EACH (EA.), bolted to concrete foundation, installed as per plans and specifications, tables to be provided by Owner, installation by Contractor, all complete in place.

29. **STATIONARY BBQ PIT INSTALLATION (REGULAR AND ADA):** When called for in the proposal shall be measured and paid per EACH (EA.), installed as per plans and specifications, including concrete pad/footing, BBQ pits to be provided by Owner, installation by Contractor, all complete in place.

30. **TRASH RECEPTACLE INSTALLATION:** When called for in the proposal, shall be measured and paid per EACH (EA.), (trash receptacles to be provided by Owner, installation by Contractor) including bolted to ground, concrete pad as required, including all materials, size, type specified, fixtures and equipment, all complete and in place.

31. **IRRIGATION SYSTEM:** When called for in the proposal shall be paid for as Lump Sum (L.S.) designed by a licensed and registered irrigation professional (plans are for schematic purposes only), for all the work according to the submitted and approved plans by the irrigation professional, and shall include all necessary pipe and hoses of the diameter and type specified for the specified location, and all necessary fittings, air relief ball valves, Controller, pressure vacuum Breaker, Electric Remote Control Valves, adaptors, demolition of existing lines, all complete in place.

32. **PEDESTAL DRINKING FOUNTAIN (NON-REFRIGERATED):** When called for in the proposal, shall be measured and paid for per EACH (EA.) including installation, and concrete pad as required, water connection, extension of water line from source, all costs of excavation and backfill of utilities shall be considered subsidiary to this item.

SPLASH PAD – PRELIMINARY IMPROVEMENTS

33. **STUB OUT AND CONDUIT FOR ELECTRICAL:** When called for in the proposal shall be measured and paid for per LUMP SUM (L.S.), including conduit with connection to equipment/storage room from electrical source.

34. **STUB OUT FOR WATER CONNECTION:** When called for in the proposal shall be measured and paid for per LUMP SUM (L.S.), including water line with connection to equipment/storage room,

35. **STUB OUT FOR SEWER CONNECTION:** When called for in the proposal shall be measured and paid for per LUMP SUM (L.S.), including sewer line connection to equipment/storage room.

LANDSCAPING AND GENERAL IRRIGATION

36. **LANDSCAPING:** When called for in the proposal shall be paid for a Lump Sum (L.S.) for all work according to the plans and specifications and final landscaping design, and shall include all plants, shrubs, trees, mulch, additional topsoil, compost, edging, and any other material to achieve the design as shown on the plans, and any other appurtenances, all complete in place. Any hauling of additional material required shall be subsidiary to this bid item.

37. **IRRIGATION SYSTEM/DRIP IRRIGATION SYSTEM:** When called for in the proposal shall be paid for as Lump Sum (L.S.) designed by a licensed and registered irrigation professional (plans are for schematic purposes only), for all the work according to the submitted and approved plans and specs, and shall include all necessary pipe and hoses of the diameter and type specified for the specified location, and shall include all necessary fittings, air relief ball valves, Controller, pressure vacuum Breaker, Electric Remote Control Valves, adaptors, demolition of existing lines, all complete in place.

BUILDINGS

38. **CONCESSION STAND WITH RESTROOMS AND STORAGE ROOM:** When called for in the proposal, shall be measured and paid per LUMP SUM (L.S.) including masonry walls, concrete foundation, roofing, floor drains, water hose bibs with locks, bathroom partition walls, doors and locking mechanisms, water closets, on demand water heater, lower cabinets and counters, mop sink, urinals, sinks, shelves, mirrors, air hand dryers, soap dispensers, handicap changing table, commercial toilet paper dispenser, lighting, conduit installation, exterior doors with locks and kickplates, plumbing and fixtures, drinking fountains, extension of electrical, water and sewer from source, including any trenching necessary, and any other appurtenances, all complete in place.

39. **TRASH RECEPTACLE INSTALLATION:** When called for in the proposal, shall be measured and paid per EACH (EA.), (trash receptacles to be provided by Owner, installation by Contractor) including bolted to ground, concrete pad as required, including all materials, size, type specified, fixtures and equipment, all complete and in place.

40. **COOLED DRINKING FOUNTAIN WITH WATER BOTTLE FILLER:** When called out in the proposal, shall be measured and paid per EACH (EA.), and shall include all materials and equipment necessary for a complete installation, all complete in place.

41. **2-INCH DOMESTIC SERVICE:** When called for in the proposal shall be measured and paid per LINEAR FOOT (LF), including service line from water meter to building, line installation, fittings, and backflow preventer, all complete in place.

42. **SANITARY SEWER SERVICE CONNECTION WITH CLEANOUTS:** When called for in the proposal, shall be measured and paid per LINEAR FOOT (L.F.), including extension of sewer service from source, all piping, excavation, trenching and backfilling all complete in place.

43. **BRONZE PLAQUE INSTALLATION:** When called for in the proposal, shall be paid for per EACH (EA.) mounted at the designated location as per manufacturer's recommendation, all complete in place.

44. **SANITARY SEWER MANHOLE:** When called for in the proposal, shall be paid for per EACH (EA.) for the depth and diameter specified for all depths, measured from natural ground, and shall include all necessary preformed fiberglass bases, sections and cones, cast iron ring and cover, excavation, bedding, select backfill, compaction, dewatering (if required), connect service lines, all complete in place.

GENERAL SITE IMPROVEMENTS

ALL EXCAVATION IS UNCLASSIFIED. COST FOR DEWATERING AND TRENCH STABILIZATION, IF REQUIRED FOR INSTALLATION OF WATER LINES OR IRRIGATION LINES, SHALL BE SUBSIDIARY TO THE VARIOUS ITEMS OF THIS SECTION.

45. **DOMESTIC SERVICE CONNECTION:** When called for in the proposal, shall be measured and paid per LUMP SUM (L.S.)**,** from City of Edinburg water line, permit fees and meter costs, including tapping of line, for the diameter, pressure class and material specified, for all depths, and shall include all necessary tapping saddles, "U" branches, valves, backflow, and box as per plans and specifications, including any City of Edinburg water standard installation details, as per plans and specifications, all complete in place.

46. **IRRIGATION SERVICE CONNECTION:** When called for in the proposal, shall be measured and paid for per LUMP SUM (L.S.) for the diameter, pressure class and material specified, including backflow preventer, all complete in place.

47. **CHAIN LINK FENCE:** When called for in the proposal, shall be measured and paid for per LINEAR FOOT (L.F)., for the height and length specified, all complete in place.

48. **ELECTRICAL PANEL AREA:** When called for in the proposal shall be measured and paid for per LUMP SUM (L.S.), and shall include concrete foundation, chain link fence for the height and type specified, gate with locking mechanism, coordination with various entities for installation of electrical panels, plants and drip system, all complete in place.

49. **ELECTRICAL SERVICE CONNECTION (ALLOWANCE):** When called for in the proposal, shall be measured and paid per LUMP SUM (L.S.), and shall include all connections by the electric provider, transformer, connection from main electrical line, coordination with MVEC for installation, all permits and fees, coordination with OWNER, and any other requirements, all complete, in place. Subject to the Owner's authorization of mutually agreed to amount paid to contractor based on MVEC's Invoice, which shall not include any markups, profit or service fees by the contractor.

50. **ELECTRICAL SERVICE - CONTRACTOR:** When called for in the proposal, shall be measured and paid per LUMP SUM (L.S.), and shall include trenching, conduit and transformer pad, coordination with MVEC for installation, coordination with Owner's personnel, and any other requirements, all complete, in place.

51. **LIGHTS – MAIN WALKWAY:** When called for in the proposal, shall be paid for EACH (EA.) for the height, brand and type specified in the plans and shall include all necessary materials, labor, equipment and installation, including foundation installation, conduit, trenching and pavement repair, wiring, light fixtures, connection to lighting control panel, in accordance with plans and specifications, all complete in place.

52. **DUMPSTER ENCLOSURE:** When called for in the proposal, shall be measure and paid for per LUMP SUM (L.S.), and shall include any minor excavation, chain link gate, painted impact bollards, locking

mechanism, painted CMU perimeter, foundation and any minor ancillary work.

SIDEWALK AND WALKWAY IMPROVEMENTS

53. **REINFORCED CONCRETE SIDEWALKS:** When called for in the proposal, shall be measured and paid per SQUARE FOOT (S.F.) for the **constructed length and width laid in accordance with Typical Details**, for the TYPE AND THICKNESS SPECIFIED, and shall include handicap ramps, and all necessary labor, excavation, backfilling, steel reinforcement, concrete of the strength specified, Compacted Subgrade as shown, Sand Cushion, seal-tight jointing material, concrete finish specified, as shown in the plans and specifications, including pre-fabricated truncated domes, ADA required color, all complete in place. ***(Wings and connections to sidewalk ramps must comply with Texas Accessibility Standards (TAS) Requirements)***.

PARKING LOT

54. **LIME OR PORTLAND CEMENT STABILIZED SUBGRADE:** When called for in the proposal, shall be measured and paid from BACK OF CURB TO BACK OF CURB per SQUARE YARD (S.Y.) for the **constructed length and width laid in accordance with Typical Details** for the TYPE AND COMPACTED THICKNESS SPECIFIED and shall include all necessary excavation, compaction as shown, working of lime or Portland cement material to the strength specified (Calculated from unit weight of subgrade material), clearing and grubbing, demolition, removal and disposal of unsuitable material such organic materials, removal of material deemed unsuitable for filling, hauling in fill material as required, all complete in place in accordance with plans and specifications.

55. **COMPACTED FLEXIBLE BASE:** When called for in the proposal, shall be measured and paid from BACK OF CURB TO BACK OF CURB per SQUARE YARD (S.Y.) for the **constructed length and width laid in accordance with Typical Details** for the TYPE AND COMPACTED THICKNESS SPECIFIED and shall include furnishing all new material, working of Lime (if required), spreading, watering, fine grading and compacting as shown in the plans and specifications, all complete in place in accordance with plans and specifications. Proof Rolling may be required in certain locations as determined by the Owner's Representative, and the cost for such work shall be considered subsidiary to the Paving Improvement Items of the Proposal.

56. **COMPACTED HOT-MIX ASPHALTIC CONCRETE:** When called for in the proposal, shall be measured and paid from LIP OF CURB (OR EDGE OF PAVEMENT) TO LIP OF CURB (OR EDGE OF PAVEMENT), per SQUARE YARD (S.Y.) for the **constructed length and width laid in accordance with Typical Details**, for the TYPE AND COMPACTED THICKNESS SPECIFIED, and shall include PRIME COAT as shown in the plans and specifications, all complete in place. Tamping and Proof Rolling may be required in certain locations of the roadway as determined by the Owner's Representative, and the cost for such work shall be considered subsidiary to the Paving Improvement Items of the Proposal.

57. **CONCRETE CURB AND GUTTER/LAYDOWN CURB**: When called for in the proposal, shall be measured and paid along the gutter line for catch, laydown or spills section, per LINEAL FOOT (L.F.), for the **constructed length in accordance with Typical Details**, measured with a surveyor's flat steel chain, for all Types indicated in the plans and specifications, and shall include all necessary labor, excavation, membrane curing compound, joints, backfilling, reinforcement, concrete of thickness and strength specified, as shown in the plans and specifications, all complete in place. ***(Concrete Curb and Gutter shall be laid over prepared base and subgrade as indicated in the typical sections. The prepared base and subgrade shall be considered subsidiary to this item).***

58. **LIGHTS – PARKING:** When called for in the proposal, shall be paid for EACH (EA.) for the height, brand and type specified in the plans and shall include all necessary materials, labor, equipment and installation, including foundation installation, conduit, trenching and pavement repair, wiring, light fixtures, connection to lighting control panel, in accordance with plans and specifications, all complete in place.

59. **BIKE RACK INSTALLATION:** When called for in the proposal, shall be measured and paid for per EACH (EA.) to be provided by Owner, installed by contractor, including all costs associated with labor, materials, equipment for the installation, and painting if required, all complete in place.

60. **THERMOPLASTIC PAVEMENT STRIPING/MARKINGS AND SIGNAGE:** When called for in the proposal, shall be paid for LUMP SUM (L.S.) for the length, width and color specified in the plans and shall include all necessary materials, labor, equipment, paint as specified, pre-fabricated pavement markers, handicap markings, wheel stops,

including raised pavement markers of type and class specified, in accordance with plans and specifications, all complete in place.

DRAINAGE IMPROVEMENTS

ALL EXCAVATION IS UNCLASSIFIED. COST FOR DEWATERING AND TRENCH STABILIZATION, IF REQUIRED FOR INSTALLATION OF DRAINAGE/STORM SEWER LINES, SHALL BE SUBSIDIARY TO THE VARIOUS ITEMS OF THIS SECTION.

61. **REINFORCED CONCRETE PIPE (RCP):** When called for in the proposal, shall be measured and paid per LINEAL FOOT (L.F.) **for the constructed length**, FOR THE DIAMETER AND CLASS SPECIFIED and as shown on the plans, **all depths**, and shall include all necessary labor, excavation, backfilling, reinforced concrete pipe of the class specified, RUBBER GASKET JOINTS, connections, all complete in place.

62. **CAST IN PLACE REINFORCED CONCRETE SAFETY END TREATMENTS:** When called for in the proposal, shall be measured and paid per EACH (E.A.) FOR THE CONNECTING PIPE DIAMETER SPECIFIED, all as shown on the plans and details, and shall include all necessary reinforced concrete RIP-RAP, connecting pipe CONCRETE BULKHEADS as shown on the Plan and Profile Sheets, **all depths**, and shall include all necessary labor, excavation, backfilling, reinforced pipe of the diameter, class and type specified, connections, all complete in place.

63. **TYPE C GRATE INLETS:** When called for in the proposal, shall be measured and paid per EACH (EA.) for the size and type specified, all depths, and shall include all necessary connections, grouting, concrete aprons (when called for in the Plans), excavation, backfilling, all complete in place.

64. **BLEEDER LINES:** When called for in the proposal, shall be measured and paid per LINEAR FOOT (LF.) for the diameter and Type specified, all depths, line and fittings, trench safety, connection to TxDOT system, coordination with TxDOT, all to the finish grade specified and complete in place**.**

65. **TRENCH SAFETY SYSTEM**: When called for in the proposal shall be measured and paid for per LUMP SUM (L.S.), and shall include all shoring, bracing, materials, equipment, daily maintenance and inspection of equipment, safety instructions to installers and laborers, slope backs, safety equipment, ladders, barricades, etc., and the requirements in the Trench Safety System Specifications, all to

accomplish a safe and secure trench opening during installation, all complete in place.

DRAINAGE MASTER PLAN

66. **DETENTION AREA CONSTRUCTION:** When called for in the proposal shall be measured and paid per LUMP SUM (LS.) at the unit price bid for all specified location(s) and shall include all necessary materials, labor and equipment to excavate, grade, and compact areas as indicated in the Plans, all complete in place.

67. **SWALE:** When called for in the proposal shall be measured and paid per LUMP SUM (LS.) at the unit price bid for all specified location(s) and shall include all necessary materials, labor and equipment to excavate, **grade to drain**, and compact areas as indicated in the Plans, all complete in place.

68. **SIDEWALK DRAIN CHUTES:** When called for in the proposal shall be measured and paid per EACH (EA.), including all labor, materials and installation as per plans and specifications.

MONUMENT SIGN – PRELIMINARY

69. **STUB OUT AND CONDUIT FOR ELECTRICAL:** When called for in the proposal shall be measured and paid for per LUMP SUM (L.S.), including conduit with connection from electrical source.

70. **CONNECTION FOR FUTURE IRRIGATION SYSTEM:** When called for in the proposal shall be measured and paid for per LUMP SUM (L.S.), including conduit with connection from water source and stub out for future sytem.

PROJECT CONTINGENCY

71. **CONTINGENCY:** When called for in the proposal shall be measured and paid in LUMP SUM (L.S.) amounts which will be subject to the Owner's authorization and written approval of mutually agreed upon amounts prior to use.

ADD ALTERNATE NO. 1 – SPLASH PARK IMPROVEMENTS

72. **MAINTENANCE/EQUIPMENT ROOM:** When called for in the proposal shall be measured and paid for per LUMP SUM (L.S.) and shall include all labor, materials and equipment, coordination with Owner and

splash park contractor, all fees and permits, connection from stub out of water, sewer and electricity into the building under the direction of the splash park contractor.

73. **TRASH RECEPTACLE INSTALLATION:** When called for in the proposal, shall be measured and paid per EACH (EA.), (trash receptacles to be provided by Owner, installation by Contractor) including bolted to ground, concrete pad as required, including all materials, size, type specified, fixtures and equipment, all complete and in place.

74. **LIGHTS:** When called for in the proposal, shall be paid for EACH (EA.) for the height, brand and type specified in the plans and shall include all necessary materials, labor, equipment and installation, including foundation installation, conduit, trenching, wiring, light fixtures, connection to lighting control panel, in accordance with plans and specifications, all complete in place.

75. **REINFORCED CONCRETE SIDEWALK:** When called for in the proposal, shall be measured and paid per SQUARE FOOT (S.F.) for the **constructed length and width laid in accordance with Typical Details**, for the TYPE AND THICKNESS SPECIFIED, and shall include handicap ramps, and all necessary labor, excavation, backfilling, steel reinforcement, concrete of the strength specified, Compacted Subgrade as shown, Sand Cushion, seal-tight jointing material, concrete finish specified, as shown in the plans and specifications, including pre-fabricated truncated domes, ADA required color, all complete in place. ***(Wings and connections to sidewalk ramps must comply with Texas Accessibility Standards (TAS) Requirements)***.

ADD ALTERNATE NO. 2 – FITNESS COURT

76. **CONCRETE PAD:** When called for n the proposal shall be measured and paid per SQUARE FOOT (S.F.) for the **constructed length and width laid in accordance with Typical Details**, for the TYPE AND THICKNESS SPECIFIED, and shall include all necessary labor, excavation, backfilling, steel reinforcement, concrete of the strength specified, Compacted Subgrade as shown, concrete finish specified, as shown in the plans and specifications all complete in place.

77. **LIGHTS:** When called for in the proposal, shall be paid for EACH (EA.) for the height, brand and type specified in the plans and shall include all necessary materials, labor, equipment and installation, including foundation installation, conduit, trenching, wiring, light fixtures,

connection to lighting control panel, in accordance with plans and specifications, all complete in place.

78. **TRASH RECEPTACLE INSTALLATION:** When called for in the proposal, shall be measured and paid per EACH (EA.), (trash receptacles to be provided by Owner, installation by Contractor) including bolted to ground, concrete pad as required, including all materials, size, type specified, fixtures and equipment, all complete and in place.

ADD ALTERNATE NO. 3 – PARKING LOT 2

79. **COMPACTED FLEXIBLE BASE:** When called for in the proposal, shall be measured and paid from BACK OF CURB TO BACK OF CURB per SQUARE YARD (S.Y.) for the **constructed length and width laid in accordance with Typical Details** for the TYPE AND COMPACTED THICKNESS SPECIFIED and shall include furnishing all new material, working of Lime (if required), spreading, watering, fine grading and compacting as shown in the plans and specifications, all complete in place in accordance with plans and specifications. Proof Rolling may be required in certain locations as determined by the Owner's Representative, and the cost for such work shall be considered subsidiary to the Paving Improvement Items of the Proposal.

80. **COMPACTED HOT-MIX ASPHALTIC CONCRETE:** When called for in the proposal, shall be measured and paid from LIP OF CURB (OR EDGE OF PAVEMENT) TO LIP OF CURB (OR EDGE OF PAVEMENT), per SQUARE YARD (S.Y.) for the **constructed length and width laid in accordance with Typical Details**, for the TYPE AND COMPACTED THICKNESS SPECIFIED, and shall include PRIME COAT as shown in the plans and specifications, all complete in place. Tamping and Proof Rolling may be required in certain locations of the roadway as determined by the Owner's Representative, and the cost for such work shall be considered subsidiary to the Paving Improvement Items of the Proposal.

81. **CONCRETE CURB AND GUTTER**: When called for in the proposal, shall be measured and paid along the gutter line for catch, laydown or spills section, per LINEAL FOOT (L.F.), for the **constructed length in accordance with Typical Details**, measured with a surveyor's flat steel chain, for all Types indicated in the plans and specifications, and shall include all necessary labor, excavation, membrane curing compound, joints, backfilling, reinforcement, concrete of thickness and strength specified, as shown in the plans and specifications, all complete in place. **(*Concrete Curb and Gutter shall be laid over prepared base***

and subgrade as indicated in the typical sections. The prepared base and subgrade shall be considered subsidiary to this item).

82. **LIGHTS – PARKING 2:** When called for in the proposal, shall be paid for EACH (EA.) for the height, brand and type specified in the plans and shall include all necessary materials, labor, equipment and installation, including foundation installation, conduit, trenching and pavement repair, wiring, light fixtures, connection to lighting control panel, in accordance with plans and specifications, all complete in place.

83. **THERMOPLASTIC PAVEMENT STRIPING/MARKINGS AND SIGNAGE:** When called for in the proposal, shall be paid for LUMP SUM (L.S.) for the length, width and color specified in the plans and shall include all necessary materials, labor, equipment, paint as specified, pre-fabricated pavement markers, handicap markings, wheel stops, including raised pavement markers of type and class specified, in accordance with plans and specifications, all complete in place.

ADD ALTERNATE NO. 4 – SKATE PARK IMPROVEMENTS

84. **STUB OUT AND CONDUIT FOR ELECTRICAL:** When called for in the proposal shall be measured and paid for per LUMP SUM (L.S.), including conduit with connection from electrical source.

ADD ALTERNATE NO. 5 – MONUMENT SIGN

85. **MONUMENT SIGN:** When called for in the proposal shall be measured and paid for per LUMP SUM (L.S.), and shall include concrete foundation, block construction, lettering and logo's as shown on the plans and specifications.

86. **LANDSCAPING AND DRIP IRRIGATION:** When called for in the proposal shall be measured and paid for per LUMP SUM (L.S.), and shall include plants and bushes, top soil, mulch, protective weed liner, drip irrigation system as shown on the plans and specifications.

87. **LIGHTS – MONUMENT SIGN:** When called for in the proposal, shall be paid for EACH (EA.) for the height, brand and type specified in the plans and shall include all necessary materials, labor, equipment and installation, including foundation installation, conduit, trenching wiring, light fixtures, connection to lighting control panel, in accordance with plans and specifications, all complete in place.

SPECIAL PROVISIONS

IN ALL CASES WHERE THESE SPECIAL PROVISIONS CONFLICT WITH THE TECHNICAL SPECIFICATION SECTIONS, GENERAL CONDITIONS OF THE AGREEMENT, SUPPLEMENTARY GENERAL CONDITIONS, CONTRACT CONDITIONS, OR ANY OTHER DOCUMENT CONTAINED HEREIN, THESE SPECIAL PROVISIONS SHALL GOVERN.

1. The CONTRACTOR shall do all necessary excavation, trenching, demolition, grading, backfill, etc., to complete the project. All excavation is unclassified. All material removed such as concrete, broken pipe, excess backfill, etc., shall become the property of the CONTRACTOR and he shall be responsible for removing it from the site at not extra expense to the OWNER. Any existing material deemed salvageable by the ENGINEER or the OWNER shall be carefully removed and hauled to a designated location as directed by the OWNER or ENGINEER within the City at no extra expense to the OWNER.

2. The CONTRACTOR shall be limited only to existing ROW for operations and/or easements provided by the OWNER. The CONTRACTOR at no extra cost to the OWNER will correct any damages done to property outside these designated work areas to its original or better conditions. It is important that the CONTRACTOR be aware of the work limits so that no damage can result to those areas outside these limits.

3. All trees, plants, grass and shrubs, except those which will be affected by construction shall be protected at all times. The areas in and adjacent to the construction site shall be restored to their original conditions after necessary fine grading is completed. The CONTRACTOR shall provide new grass of the same type removed to restore damaged areas. Only quality sandy loam topsoil shall be used for filling the top four inches of those areas damaged or filled.

4. Existing lawns are to remain intact as far as practical. The CONTRACTOR shall duly restore such areas disturbed to as good or better than original condition using the same type of grass, shrubs, or cover as the original. The CONTRACTOR shall be responsible for correcting any erosion that occurs at his cost without claim for extra compensation.

5. Damages done to existing utilities, power poles, fences, signs, mailboxes, driveways, culverts, pavement, drainage systems, etc. shall be repaired by the CONTRACTOR at no cost to the OWNER, and such costs shall be subsidiary to the various unit items in the Proposal.

6. The OWNER shall provide all testing. Testing shall be paid by the OWNER on all necessary testing selected by ENGINEER, but re-testing shall be charged to the CONTRACTOR from his monthly estimates, and no additional compensation will be made or allowed for reworking the necessary defective work not meeting the specified work of the plans and specifications. Any re-testing required by no-passing results shall be paid for by the

CONTRACTOR and shall be deducted from the contract amount. The ENGINEER, at his sole discretion, may require the CONTRACTOR to perform any necessary uncovering of any improvements to verify compliance with specifications by either visual observation or materials testing at no extra expense to the OWNER.

7. The CONTRACTOR shall furnish the Site Inspector and Observer, OWNER, and ENGINEER the names, address and telephone numbers of all personnel responsible for the work in case of Emergencies.

8. The successful CONTRACTOR shall attend a Pre-Construction Conference with the OWNER and ENGINEER at the date and time specified.

9. The CONTRACTOR shall submit to the ENGINEER a proposed sequence of work outline with approximate completion dates to be reviewed at the pre-construction conference. During the course of construction, the ENGINEER may request updates to the schedule indicating the start of the several part of the work and the estimated dates of completion of the several parts. Unless otherwise noted on the plans, the ENGINEER may require modification of construction schedule to meet any OWNER recognized or OWNER sponsored events which may be affected by the CONTRACTOR'S activities without claim for extra compensation.

10. It is important that traffic be interrupted at a minimum during construction. Prior to any ***Public Road Closures***, a Traffic Control Plan (TCP), prepared by a Registered Professional Engineer, must be submitted by the CONTRACTOR and written approval must be issued by the ENGINEER and OWNER. The OWNER may, at its sole discretion, require continuous operation of construction activities to minimize traffic interruption. The preparation and submittal of the TCP, its approval process, or continuous operation requirement shall not constitute a claim for additional compensation or time extension of the Project.

11. The CONTRACTOR is solely responsible for notifying the Engineering Department, Police Department, Fire Department, School District, Emergency Services, and other interested entities at least 48 hours in advance of any OWNER approved road closures or detours.

12. All traffic control devices shall be in accordance with the Texas Manual on Uniform Traffic Control Devices (TMUTCD), latest edition.

13. All work must be performed during regular business hours of 8 a.m. to 5 p.m., Monday thru Friday, except OWNER recognized holidays. It is the CONTRACTOR'S sole responsibility to complete all work within the time specified in the Contract during the designated hours of operation. The CONTRACTOR may request work outside these hours, but will require the presence of the City's Field Inspector, the cost of which will be borne by the CONTRACTOR. No cost for the OWNER'S Field Representative will be charged should the work be requested by the OWNER.

14. The CONTRACTOR shall be responsible for construction staking for the entire project and shall be done in accordance with the Specifications. The OWNER shall provide horizontal

and vertical control. Staking shall be performed by a Registered Professional Land Surveyor or Professional Engineer qualified to do such construction staking at no additional cost to the OWNER. CUT SHEETS shall be submitted to the ENGINEER and OWNER for review and approval.

15. The Plans show approximate locations of existing utilities including gas lines, telephone lines, power lines, water lines, sewer lines, storm sewers and irrigation lines within the vicinity. The CONTRACTOR is responsible for locating all existing utilities and shall exercise extreme care in working in the vicinity of these lines. The CONTRACTOR shall notify the Utility Companies while working in the vicinity of the corresponding private or public utilities.

16. All existing lines, whether belonging to the Public or Private shall remain in operation at all times. Switchover time, re-connecting new service from existing lines or services (if any) shall be kept to a minimum. Unless otherwise shown as a Bid Item, reconnections to existing water and sanitary sewer services shall be subsidiary to all items of the Bid Proposal at no additional cost to the OWNER.

17. The OWNER reserves the right to add or delete quantities of bid items in the Proposal at the Unit Prices given, provided however that such additions or reductions are within the aggregate limits specified in the General Conditions of the Agreement. No additional compensation will be made to the CONTRACTOR for increases in quantities resulting from deviations from the dimensions of the plans unless such deviation is approved in writing and in accordance with the Change Order provisions of the Contract Documents.

18. .The CONTRACTOR is expected to conduct his work in such a manner as to minimize any soil erosion or sediment runoff from the construction site. CONTRACTOR shall provide ENGINEER and OWNER an Erosion Control Plan (ECP) as part of a permit application to be completed and approved by the ENGINEER prior to commencement of work. Earth cuts and fills shall have smooth, flat side slopes, as generally indicated on the Plans, to preclude erosion of the soil. Such operations should be times consistent with the actual need for doing the work and only to leave raw, unprotected surfaces for a minimum of time. The preparation and submittal of the ECP or its approval process shall not constitute a claim for additional compensation or time extension of the Project.

19. Until acceptance by the ENGINEER of any part of all of the material, as provided for in these specifications, it shall be under the charge and care of the CONTRACTOR, and he shall take every necessary precaution against injury or damage to any part of the material by action of the elements of the non-execution of the work. The CONTRACTOR shall rebuild, repair, restore and make good, at his own expense, all injuries or damage to any portion of the material occasioned by any of the above causes before its completion and acceptance.

20. In cases where the CONTRACTOR deems extra compensation is due him for materials not clearly covered in the contract, or not ordered by the ENGINEER as an extra item, the CONTRACTOR shall notify the ENGINEER in writing of his intention to make claim for such extra compensation before he begins the work. The CONTRACTOR shall not proceed

until the OWNER, ENGINEER, and CONTRACTOR approves a written CHANGE ORDER. Failure on the part of the CONTRACTOR to give such notification or to afford the ENGINEER proper facilities for keeping strict account of actual cost shall constitute a waiver of the claim for such extra compensation. The filing of such notice by the CONTRACTOR and the keeping of costs by the ENGINEER shall not in any way be construed to prove the validity of the claim. When the work has been completed, the CONTRACTOR shall, within 10 days, file his claim for extra compensation with the ENGINEER.

21. Upon the failure of the CONTRACTOR to repair satisfactorily or to remove and replace, if so directed, rejected, unauthorized, or condemned materials immediately after receiving written notice from the ENGINEER, the OWNER may recover for such defective materials on the CONTRACTOR'S bond, or by action in a court having proper jurisdiction over such matters, or may employ labor and equipment and satisfactorily repair or remove and replace such work and charge the cost of the same to the CONTRACTOR, which cost will be deducted from any money due him.

22. The CONTRACTOR shall warrant all work for a period of not less that one (1) year from the date of final acceptance of the work by the ENGINEER. CONTRACTOR is responsible for scheduling a final inspection in the presence of the OWNER, ENGINEER, and CONTRACTOR, whereupon all items must be in accordance with plans and specifications prior to final acceptance.

23. All asphalt pavement repairs shall be completed as per the construction plans and specifications. The CONTRACTOR shall not leave any area requiring repairs in excess of 1,300 square yards or in excess of 30 days, whichever is less. The OWNER or ENGINEER may require immediate asphalt pavement repair should traffic conditions warrant. Failure by the CONTRACTOR to make the necessary repairs within the time specified by the OWNER may result in corrective action by the OWNER including the employ of materials, labor and equipment to satisfactorily perform such work and charge the cost of the same to the CONTRACTOR, which cost will be deducted from any money due him.

AGREEMENT FOR ENGINEERING/ARCHITECTURAL CONSTRUCTION

THIS AGREEMENT is dated as of the _____ day of _____in the year **20___** by and between the Edinburg Economic Development Corporation (EEDC), (hereinafter called OWNER) and _____(hereinafter called CONTRACTOR). OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1. WORK.

CONTRACTOR shall complete the WORK as specified or indicated in the OWNER's Contract Documents entitled **Bid No. 19-001 Edinburg North Park**

The WORK of this Contract is comprised of construction of sports complex as shown on the plans and specifications.

ARTICLE 2. CONTRACT TIMES.

The WORK shall be completed within **270** Calendar days from the commencement date stated in the Notice to Proceed.

ARTICLE 3. TIME OF COMPLETION.

OWNER and the CONTRACTOR recognize that time is of the essence of this agreement and that the OWNER may suffer financial loss if the WORK is not completed within the time specified in Article 2 herein, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. Accordingly, instead of requiring any such proof, the OWNER and the CONTRACTOR agree that not as a penalty, but as added expense for Engineering/Architectural supervision the CONTRACTOR shall pay the OWNER for each day that expires after the time specified in Article 2 herein the amount corresponding below:

FOR AMOUNT OF CONTRACT	**COST PER DAY**
$ 5,000.00 to $ 25,000.00	$100.00
$ 25,001.00 to $ 100,000.00	$200.00
$ 100,001.00 to $ 500,000.00	$250.00
$ 500,001.00 to $1,000,000.00	$300.00
$1,000,001.00 to $2,000,000.00	$400.00
$2,000,001.00 to $3,000,000.00	$500.00
$3,000,001.00 to $4,000,000.00	$600.00
$4,000,001.00 to $5,000,000.00	$700.00
$5,000,001.00 and over	$800.00

ARTICLE 4. CONTRACT PRICE.

OWNER shall pay CONTRACTOR for completion of the WORK in accordance with the Contract Documents in current funds the amount set forth in the Bid Proposal Form(s), being:

_____

ARTICLE 5. PAYMENT PROCEDURES.

CONTRACTOR shall submit Applications for Payment in accordance with the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

ARTICLE 6. CONTRACT DOCUMENTS.

The Contract Documents which comprise the entire agreement between OWNER and CONTRACTOR concerning the WORK consist of this Agreement and the following attachments to this Agreement:

- Notice to Bidders
- Addenda
- Instructions to Bidders
- Owner's Forms
- Bid Proposal Forms including the Bid, Bid Schedule(s), Information Required of Bidder, Bid Bond, and all required certificates and affidavits
- Special Provisions
- Agreement for Engineering/Architectural Construction
- Performance Bond
- Payment Bond
- General Conditions of Contract for Engineer/Architectural Construction
- Supplemental General Conditions
- Technical Specifications
- Drawings

- Change Orders which may be delivered or issued after Effective Date of the Agreement and are not attached hereto.

There are no Contract Documents other than those listed in this Article 6. The Contract Documents may only be amended by Change Order as provided in the General Conditions.

ARTICLE 7. ASSIGNMENT

No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

ARTICLE 8. MEDIATION CLAUSE

It is the intent of the parties that litigation be avoided, and in order to allow for the quick resolution of any and all disputes, if any, the parties hereby agree that any claims, demands or disputes that cannot be amicably resolved between the parties upon written request by either party shall be submitted within two weeks to a neutral, trained third party for assistance in dispute resolution by means of non-binding mediation.

ARTICLE 9. DISPUTE RESOLUTION/LITIGATION

All claims, disputes and other controversy between CONTRACTOR and OWNER arising out of or in any way related to the services provided by CONTRACTOR shall be submitted to mediation, before and as a condition precedent to other remedies provided by law. If a dispute at law arises related to these services and that dispute requires litigation as provided above, OWNER, assents to personal jurisdiction in the State of Texas; the claim will be brought and tried in Hidalgo County. The prevailing party will be entitled to recovery of all court costs, attorneys' fees, and other legally recoverable claim-related expenses.

ARTICLE 10. NOTICE

All notices or other communications required under this Agreement may be affecter either by personal delivery in writing or by Certified Mail, Return Receipt Requested. Notice shall be deemed to have been given when delivered or mailed to the parties at their respective addresses as set forth below or when mailed to the last address provided in writing to the other party by the addressee.

OWNER and CONTRACTOR each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents.

IN WITNESS WHEREOF, OWNER and CONTRACTOR have caused this Agreement to be executed the day and year first above written.

OWNER: **EDINBURG EDC**

_____	_____
By _____	By_____
[CORPORATE SEAL]	
Attest_____	Attest_____
Address for giving notices	Address for giving notices
415 W. UNIVERSITY DRIVE **EDINBURG, TEXAS 78541**	
	License No. _____
Approved as to Form:	
_____	Agent for service of process: _____
(Signature)	
_____	_____
(Title)	

AGREEMENT CERTIFICATE

(if Corporation)

STATE OF)
) SS:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Board of Directors of the _____

_____

a corporation existing under the laws of the State of _____, held on _____, 20___, the following resolution was duly passed and adopted:

"RESOLVED, that _____, as

_____President of the Corporation, be and is hereby authorized to execute the Agreement dated _____, 20_____, by and between this Corporation and the OWNER, and that his/her execution thereof, attested by the Secretary of the Corporation, and with the Corporate Seal affixed, shall be the official act and deed of this Corporation."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of the corporation this _____, day of _____, 20___.

_____
Secretary

(SEAL)

AGREEMENT CERTIFICATE

(if Partnership)

STATE OF)
) SS:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Partners of the _____ _____

_____

a partnership existing under the laws of the State of _____, held on _____,

20____, the following resolution was duly passed and adopted:

"RESOLVED, that _____, as

_____of the Partnership,

be and is hereby authorized to execute the Agreement dated_____ ,

20____, by and between this Partnership and the OWNER, and that his/her execution

thereof, attested by the _____shall be the official act and

deed of this Partnership."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this _____, day of _____, 20____.

_____
Partner

(SEAL)

AGREEMENT CERTIFICATE

(if Joint Venture)

STATE OF)
) SS:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Principals of the_____

_____

a joint venture existing under the laws of the State of _____, held on _____

_____, 20___, the following resolution was duly passed and adopted:

"RESOLVED, that _____, as

_____of the Joint Venture,

be and is hereby authorized to execute the Agreement dated _____,

20_____, by and between this Joint Venture and the OWNER, and that his/her execution

thereof, attested by the _____ shall be the official act and

deed of this Joint Venture."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this _____, day of _____

_____, 20____.

_____
Managing Partner

(SEAL)

END OF AGREEMENT

PERFORMANCE BOND

STATUTORY PERFORMANCE BOND PURSUANT TO ARTICLE 2253
OF THE TEXAS LOCAL GOVERNMENT CODE AS AMENDED BY ACTS OF THE 1993,
73RD LEGISLATURE, CH. 268, § 1, EFF. SEPT. 1, 1993
****

KNOW ALL MEN BY THESE PRESENTS, THAT _____

_____

_____

_____

(hereinafter called the Principal(s), as Principal(s), and _____

_____

_____

_____

_____

(hereinafter called the Surety(s), as Surety(s), are held and firmly bound unto _____

_____

_____

_____

_____

_____

(hereinafter called the Obligee), in the amount of _____

_____Dollars ($_____)

for the payment whereof the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the _____day of _____, 20_____, for the _____

_____

PERFORMANCE BOND Continued:

which contract is hereby referred to and made a part hereof as fully and to the same extent as if copies at length herein.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall faithfully perform the work in accordance with plans, specifications and contract documents, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Statutory Performance Bond Pursuant To Article 2253 of the Texas Local Government Code as Amended by Acts of the 1993, 73rd Legislature, Ch. 268, § 1, Eff. Sept. 1, 1993, and all liabilities on this bond shall be determined in accordance with the provisions of said Article to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, this instrument is executed in four counterparts, each one of which shall be deemed an original, this the _____ day of _____ A.D., 20____.

_____
Principal

ATTEST:

_____ _____
(Principal) Secretary Signature
(SEAL)

_____ _____
Witness as to Principal (Print/Type Name)

_____ _____
(Address) (Address)

ATTEST:

_____
Surety

_____ _____
(Surety) Secretary Attorney-in-Fact (Signature)
(SEAL)

_____ _____
Witness as to Surety (Print/Type Name)

_____ _____
(Address) (Address)

NOTE: Date of Bond must not be prior to date of Contract

(1) Correct name of Contractor; (2) A Corporation, a Partnership or an Individual, as case may be; (3) Correct name of Surety; (4) Correct name of Owner; (5) County or Parish and State; (6) Owner; (7) If Contractor is Partnership, all partners should execute bond.

PAYMENT BOND

STATUTORY PAYMENT BOND PURSUANT TO ARTICLE 2253
OF THE TEXAS LOCAL GOVERNMENT CODE AS AMENDED BY ACTS OF THE 1993,
73RD LEGISLATURE, CH. 268, § 1, EFF. SEPT. 1, 1993

****

KNOW ALL MEN BY THESE PRESENTS, that _____

_____

_____

_____

_____

(hereinafter called the Principal(s), as Principal(s), and _____

_____

_____

_____

_____

_____

(hereinafter called the Surety(s), as Surety(s), are held and firmly bond unto _____

_____

_____

_____

(hereinafter called the Obligee), in the amount of _____

_____Dollars ($_____)

for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the _____ day of _____, 20_____, to which contract is hereby referred to and made a part hereof as fully and to the same extent as if copies at length herein.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall pay all claimants supplying labor and material to him or a subcontractor in the prosecution of the work provided for in said contract, then, this obligation shall be void; otherwise to remain in full force and affect.

PAYMENT BOND Continued:

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Statutory Payment Bond Pursuant To Article 2253 of the Texas Local Government Code as Amended by Acts of the 1993, 73rd Legislature, Ch. 268, § 1, Eff. Sept. 1, 1993, , and all liabilities on this bond shall be determined in accordance with the provisions of said Article to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, this instrument is executed in four counterparts, each one of which shall be deemed an original, this the _____ day of _____ A.D., 20_____.

_____
Principal

ATTEST:

_____ _____
(Principal) Secretary Signature
(SEAL)

_____ _____
Witness as to Principal (Print/Type Name)

_____ _____
(Address) (Address)

ATTEST: _____ _____
Surety

_____ _____
(Surety) Secretary Attorney-in-Fact (Signature)
(SEAL)

_____ _____
Witness as to Surety (Print/Type Name)

_____ _____
(Address) (Address)

NOTE: Date of Bond must not be prior to date of Contract

(1) Correct name of Contractor; (2) A Corporation, a Partnership or an Individual, as case may be; (3) Correct name of Surety; (4) Correct name of Owner; (5) County or Parish and State; (6) Owner; (7) If Contractor is Partnership, all partners should execute bond.

GENERAL CONDITIONS

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ARTICLE 1 -- DEFINITIONS

Wherever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated in this Article 1 which meanings are applicable to both the singular and plural thereof. If a word which is entirely in upper case in these definitions is found in lower case in the Contract Documents, then the lower case word will have its ordinary meaning.

Addenda - Written or graphic instruments issued prior to the opening of Bids which make additions, deletions, or revisions to the Contract Documents.

Agreement -The written contract between the OWNER and the CONTRACTOR covering the WORK to be performed; other documents are attached to the Agreement and made a part thereof as provided therein.

Application for Payment - The form accepted by the ENGINEER which is to be used by the CONTRACTOR to request progress payments or final payment and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

Asbestos -Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

Bid -The offer or proposal of the Bidder submitted on the prescribed form setting forth the price or prices for the WORK.

Bonds - Bid, Performance, and Payment Bonds and other instruments of security.

Change Order -A document recommended by the ENGINEER, which is signed by the CONTRACTOR and the OWNER, and authorizes an addition, deletion, or revision in the WORK, or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

Clarification -A document issued by the ENGINEER to the CONTRACTOR that interprets the requirement(s) and/or design intent of the Contract Documents, which may not represent an addition, deletion, or revision in the WORK or an adjustment in the Contract Price or the Contract Times.

Contract Documents- The Notice Inviting Bids, Instructions to Bidders, Bid Forms (including the Bid, Bid Schedule(s), Information Required of Bidder, Bid Bond, and all required certificates, affidavits and other documentation), Agreement, Performance Bond, Payment Bond, General Conditions, Supplementary General Conditions, Technical Specifications, Drawings, all Addenda, and Change Orders executed pursuant to the provisions of the Contract Documents. Shop Drawings are not Contract Documents.

Contract Price- The total monies payable by the OWNER to the CONTRACTOR under the terms and conditions of the Contract Documents.

Contract Times - The number or numbers of successive calendar days or dates stated in the Contract Documents for the completion of the WORK.

CONTRACTOR -The individual, partnership, corporation, joint-venture, or other legal entity with whom the OWNER has executed the Agreement.

Day- A calendar day of 24 hours measured from midnight to the next midnight.

Defective Work - Work that is unsatisfactory, faulty, or deficient; or that does not conform to the Contract Documents; or that does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents; or work that has been damaged prior to the ENGINEER's recommendation of final payment.

Drawings -The drawings, plans, maps, profiles, diagrams, and other graphic representations which indicate the character, location, nature, extent, and scope of the WORK and which have been prepared by the ENGINEER and are included and/or referred to in the Contract Documents. Shop Drawings are not Drawings as so defined.

Effective Date of the Agreement - The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

ENGINEER - The individual, partnership, corporation, joint-venture, or other legal entity named as such by the OWNER as set forth in the Supplementary General Conditions.

Field Order -A written order issued by the ENGINEER which may or may not involve a change in the WORK.

General Requirements - Division 1 of the Technical Specifications.

Hazardous Waste - The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

Laws and Regulations; Laws or Regulations -Any and all applicable laws, rules, regulations, ordinances, codes, and/or orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

Lien or Mechanic's Lien - A form of security, an interest in real property, which is held to secure the payment of an obligation. When related to public works construction, Lien or Mechanic's Lien may be called Stop Notice.

Milestone - A principal event specified in the Contract Documents relating to an intermediate completion date of a separately identifiable part of the WORK or a period of time within which

the separately identifiable part of the WORK should be performed prior to Substantial Completion of all the WORK.

Notice of Award -The written notice by the OWNER to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the conditions precedent enumerated therein within the time specified, the OWNER will enter into an Agreement.

Notice of Completion - A form signed by the ENGINEER and the CONTRACTOR recommending to the OWNER that the WORK is Substantially Complete and fixing the date of Substantial Completion. After acceptance of the WORK by the OWNER's governing body, the form is signed by the OWNER and filed with the County Recorder. This filing starts the 30 day lien filing period on the WORK.

Notice to Proceed -The written notice issued by the OWNER to the CONTRACTOR authorizing the CONTRACTOR to proceed with the WORK and establishing the date of commencement of the Contract Times.

OWNER - The public body or authority, corporation, association, firm, or person with whom the CONTRACTOR has entered into the Agreement and for whom the WORK is to be provided.

Partial Utilization - Use by the OWNER of a substantially completed part of the WORK for the purpose for which it is intended prior to Substantial Completion of all the WORK.

PCBs - Polychlorinated biphenyls.

Petroleum - Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Wastes and crude oils.

Project -The total construction project of which the WORK to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

Radioactive Material - Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

Resident Project Representative - The authorized representative of the ENGINEER who is assigned to the Site or any part thereof.

Samples -Physical examples of materials, equipment, or workmanship that are representative of some portion of the WORK and which establish the standards by which such portion of the WORK will be judged.

Shop Drawings - All drawings, diagrams, illustrations, schedules, and other data which are specifically prepared by or for the CONTRACTOR and submitted by the CONTRACTOR to illustrate some portion of WORK.

Site - Lands or other areas designated in the Contract Documents as being furnished by the OWNER for the performance of the construction, storage, or access.

Specifications - (Same definition as for Technical Specifications hereinafter).

Stop Notice - A legal remedy for subcontractors and suppliers who contribute to public works, but who are not paid for their work, which secures payment from construction funds possessed by the OWNER. In some states, for public property, the Stop Notice remedy is designed to substitute for a mechanic's lien.

Subcontractor -An individual, partnership, corporation, joint-venture, or other legal entity having a direct contract with the CONTRACTOR or with any other Subcontractor for the performance of a part of the WORK at the Site.

Substantial Completion - The time at which the WORK (or specified part) has progressed to the point where it is sufficiently complete, in accordance with the Contract Documents, as evidenced by Notice of Completion (or Notice of Partial Utilization) so that the WORK (or specified part) can be utilized for the purposes for which it is intended; or, if no such notice is issued, when final payment is due in accordance with Paragraph 14.8. The terms "substantially complete" and "substantially completed" as applied to any work refer to substantial completion thereof.

Supplementary General Conditions -The part of the Contract Documents which make additions, deletions, or revisions to these General Conditions.

Supplier - A manufacturer, fabricator, distributor, materialman, or vendor having a direct contract with the CONTRACTOR or with any Subcontractor to furnish materials, equipment, or product to be incorporated in the WORK by the CONTRACTOR or any Subcontractor.

Technical Specifications - Divisions 1 through 17 of the Contract Documents consisting of the General Requirements and written technical descriptions of products and execution of the WORK.

Utilities - All pipelines, conduits, ducts, cables, wires, tracks, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities which have been installed underground or above the ground to furnish any of the following services or materials: water, sewage, sludge, drainage, fluids, electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, traffic control, or other control systems.

WORK -The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. WORK is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents.

ARTICLE 2 -- PRELIMINARY MATTERS

2.1 DELIVERY OF BONDS AND INSURANCE CERTIFICATES

A. When the CONTRACTOR delivers the signed Agreement to the OWNER, the CONTRACTOR shall also deliver to the OWNER such Bonds and insurance policies and certificates as the CONTRACTOR may be required to furnish in accordance with the Contract Documents.

2.2 COPIES OF DOCUMENTS

A. The OWNER will furnish to the CONTRACTOR the required number of copies of the contract Documents specified in the Supplementary General Conditions.

2.3 COMMENCEMENT OF CONTRACT TIMES; NOTICE TO PROCEED

A. The Contract Times will start to run on the commencement date stated in the Notice to Proceed.

2.4 STARTING THE WORK

A. The CONTRACTOR shall begin to perform the WORK on the commencement date stated in the Notice to Proceed, but no work shall be done at the Site prior to said commencement date.

B. Before undertaking each part of the WORK, the CONTRACTOR shall review the Contract Documents in accordance with Paragraph 3.3.

2.5 PRECONSTRUCTION CONFERENCE

A. The CONTRACTOR is required to attend a preconstruction conference. This conference will be attended by the OWNER, ENGINEER, and others as appropriate in order to discuss the WORK in accordance with the applicable procedures specified.

B. The CONTRACTOR's initial schedule submittals for shop drawings, obtaining permits, and Plan of Operation and Schedule will be reviewed and finalized. As a minimum, the CONTRACTOR's representatives should include its project manager and schedule expert. The CONTRACTOR should plan on this meeting taking no less than 3 hours. If the submittals are not finalized at the end of the meeting, additional meetings will be held so that the submittals can be finalized prior to the submittal of the first Application for Payment. No Application for Payment will be processed prior to receiving acceptable initial submittals from the CONTRACTOR.

ARTICLE 3 -- INTENT AND USE OF CONTRACT DOCUMENTS

3.1 INTENT

A. The Contract Documents comprise the entire agreement between the OWNER and the CONTRACTOR concerning the WORK. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of the State in which the Project is located.

B. It is the intent of the Contract Documents to describe the WORK, functionally complete, to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not called for specifically.

C. When words or phrases which have a well-known technical or construction industry or trade meaning are used to describe work, materials, or equipment such words or phrases shall be interpreted in accordance with that meaning unless a definition has been provided in Article 1 of the General Conditions.

3.2 REFERENCE TO STANDARDS

A. Reference to standard specifications, manuals, or codes of any technical society, organization, or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code shall be effective to change the duties and responsibilities of the OWNER, the CONTRACTOR, the ENGINEER, or any of their consultants, agents, or employees, from those set forth in the Contract Documents, nor shall it be effective to assign to OWNER, ENGINEER, or any of ENGINEER's consultants, agents, or employees any duty or authority to direct the performance of the WORK or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.3 REVIEW OF CONTRACT DOCUMENTS

A. If, during the performance of the WORK, CONTRACTOR discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any such Law or Regulation applicable to the performance of the WORK or of any such standard, specification, manual, or code, or of any instruction of any Supplier, CONTRACTOR shall report it to ENGINEER in writing at once, and CONTRACTOR shall not proceed with the work affected thereby (except in an emergency as authorized by Paragraph 6.12) until a Clarification, Field Order, or Change Order to the Contract Documents has been issued.

3.4 ORDER OF PRECEDENCE OF CONTRACT DOCUMENTS

A. In resolving conflicts resulting from errors or discrepancies in any of the Contract Documents, the order of precedence shall be as follows:

1. Permits from other agencies as may be required by law
2. Change Orders
3. Agreement
4. Addenda
5. Contractor's Bid (Bid Form)
6. Special Provisions
7. Notice to Bids
8. Instructions to Bidders
9. Supplementary General Conditions
10. General Conditions
11. Technical Specifications
12. Referenced Standard Specifications
13. Drawings

B. With reference to the Drawings the order of precedence is as follows:

1. Figures govern over scaled dimensions
2. Detail drawings govern over general drawings
3. Addenda/Change Order drawings govern over any other drawings
4. Drawings govern over standard drawings

3.5 AMENDING CONTRACT DOCUMENTS

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the WORK or to modify the terms and conditions thereof by a Change Order (pursuant to Article 10).

3.6 REUSE OF DOCUMENTS

A. Neither the CONTRACTOR, nor any Subcontractor or Supplier, nor any other person or organization performing any of the WORK under a contract with the OWNER shall have or acquire any title to or ownership rights in any of the Drawings, Technical Specifications, or other documents used on the WORK, and they shall not reuse any of them on the extensions of the Project or any other project without written consent of OWNER.

ARTICLE 4 -- SITE OF THE WORK

4.1 AVAILABILITY OF LANDS

A. The OWNER will furnish, as indicated in the Contract Documents, the lands upon which the WORK is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for the use of the CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by the OWNER, unless otherwise provided in the Contract Documents. Nothing contained in the Contract Documents shall be interpreted as giving the CONTRACTOR exclusive occupancy of the lands or rights-of-way provided. The CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment; provided, that the CONTRACTOR shall not enter upon nor use any property not under the control of the OWNER until a written temporary construction easement agreement has been executed by the CONTRACTOR and the property owner, and a copy of said easement furnished to the ENGINEER prior to said use; and, neither the OWNER nor the ENGINEER will be liable for any claims or damages resulting from the CONTRACTOR's trespass on or use of any such properties. The CONTRACTOR shall provide the OWNER with a signed release from the property owner confirming that the lands have been satisfactorily restored upon completion of the WORK.

4.2 REPORTS OF PHYSICAL CONDITIONS

A. Subsurface Explorations: Reference is made to the Supplementary General conditions for identification of those reports of explorations and tests of subsurface conditions at the Site that have been utilized by the ENGINEER in the preparation of the Contract Documents.

B. Existing Structures: Reference is made to the Supplementary General Conditions for identification of those drawings of physical conditions in or relating to existing surface and subsurface structures (except underground Utilities referred to in Paragraph 4.3 herein) which are at or contiguous to the Site that have been utilized in the preparation of the Contract Documents.

C. Neither the OWNER nor ENGINEER makes any representation as to the completeness of the reports or drawings referred to in Paragraph 4.2 A or B above or the accuracy of any data or information contained therein. The CONTRACTOR may rely upon the accuracy of the technical data contained in such reports and drawings. However, the CONTRACTOR may not rely upon any interpretation of such technical data, including any interpolation or extrapolation thereof, or any non-technical data, interpretations, and opinions contained therein.

4.3 PHYSICAL CONDITIONS - UNDERGROUND UTILITIES

A. Indicated: The information and data indicated in the Contract Documents with respect to existing underground Utilities at or contiguous to the Site are based on information and data furnished to the OWNER or the ENGINEER by the owners of such underground Utilities or by others. Unless it is expressly provided in the Supplementary General Conditions and/or Section 01011 – Site Conditions, the OWNER and the ENGINEER

will not be responsible for the accuracy or completeness of any such information or data, and the CONTRACTOR shall have full responsibility for reviewing and checking all such information and data, for locating all underground Utilities indicated in the Contract Documents, for coordination of the WORK with the owners of such underground Utilities during construction, for the safety and protection thereof and repairing any damage thereto resulting from the WORK, the cost of all of which are deemed to have been included in the Contract Price.

B. Not Indicated: If an underground Utility is uncovered or revealed at or contiguous to the Site which was not indicated in the Contract Documents and which the CONTRACTOR could not reasonably have been expected to be aware of, the CONTRACTOR shall identify the owner of such underground Utility and give written notice thereof to that owner and shall notify the ENGINEER in accordance with the requirements of the Supplementary General Conditions and Section 01011 – Site Conditions.

4.4 DIFFERING SITE CONDITIONS

A. The CONTRACTOR shall notify the ENGINEER, in writing, of the following unforeseen conditions, hereinafter called differing Site conditions, promptly upon heir discovery (but in no event later than 14 days after their discovery) and before they are disturbed:

1. Subsurface or latent physical conditions at the Site of the WORK differing materially from those indicated, described, or delineated in the Contract Documents, including those reports discussed in Paragraph 4.2, 4.3, and 4.5; and
2. Unknown physical conditions at the Site of the WORK of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents, including those reports and documents discussed in Paragraph 4.2, 4.3, and 4.5.

B. The ENGINEER will review the pertinent conditions, determine the necessity of obtaining additional explorations or tests with respect thereto, and advise the OWNER, in writing, of the ENGINEER's findings and conclusions.

C. If the OWNER concludes that because of newly discovered conditions a change in the Contract Documents is required, a Change Order will be issued as provided in Article 10 to reflect and document the consequences of the difference.

D. In each such case, an increase or decrease in the Contract Price or an extension or shortening of the Contract Times, or any combination thereof, will be allowable to the extent that they are attributable to any such difference. If the OWNER and the CONTRACTOR are unable to agree as to the amount or length thereof, a claim may be made therefor as provided in Articles 11 and 12.

E. The CONTRACTOR's failure to give notice of differing Site conditions within 14 days of their discovery and before they are disturbed shall constitute a waiver of all claims in connection therewith, whether direct or consequential in nature.

4.5 HAZARDOUS MATERIALS

A. Reference is made to the Supplementary General Conditions for identification of those reports and drawings relating to Asbestos, Hazardous Waste, PCBs, Petroleum and/or Radioactive Material identified at the Site that have been utilized by the ENGINEER in the preparation of the Contract Documents.

B. OWNER shall be responsible for any Asbestos, Hazardous Waste, PCBs, Petroleum, or Radioactive Material uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the WORK and which may present a substantial danger to persons or property exposed thereto in connection with the WORK at the Site. OWNER will not be responsible for any such material brought to the Site by CONTRACTOR, Subcontractors, Suppliers, or anyone else for whom CONTRACTOR is responsible.

1. Upon discovery of any Asbestos, Hazardous Waste, PCBs, Petroleum, or Radioactive Material, the CONTRACTOR shall immediately stop all work in any area affected thereby (except in an emergency as required by Paragraph 6.12) and notify OWNER and ENGINEER (and thereafter confirm such notice in writing). CONTRACTOR shall not be required to resume any work in any such affected area until after OWNER has obtained any required permits related thereto and delivered to CONTRACTOR special written notice. Such written notice will specify that such condition and any affected area is or has been rendered safe for the resumption of the work or specify any special conditions under which the work may be resumed safely. If OWNER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of adjustment, if any, in Contract Price or Contract Times as a result of such work stoppage or such special conditions under which work is agreed by CONTRACTOR to be resumed, either party may make a claim therefor as provided in Articles 11 and 12.
2. If, after receipt of such special written notice, CONTRACTOR does not agree to resume such WORK based on a reasonable belief it is unsafe, or does not agree to resume such WORK under special conditions, then OWNER may order such portion of the WORK that is in connection with such hazardous condition or in such affected area to be deleted from the WORK. If OWNER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of deleting such portion of the WORK then either party may make a claim therefor as provided in Articles 11 and 12. OWNER may have such deleted portion of the WORK performed by OWNER's own forces or others in accordance with Article 7.

C. To the fullest extent permitted by Laws and Regulations, OWNER will indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's consultants,

and the officers, directors, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages arising out of or resulting from such hazardous condition; provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the WORK itself), including the loss of use resulting therefrom. Nothing in this Paragraph shall obligate OWNER to indemnify a person or entity from and against the consequences of that person's or entity's own negligence.

D. The provisions of Paragraphs 4.2, 4.3, and 4.4 are not intended to apply to Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material uncovered or revealed at the Site.

4.6 REFERENCE POINTS

A. The OWNER will provide one bench mark, near or on the Site of the WORK, and will provide two points near or on the Site to establish a base line for use by the CONTRACTOR for alignment control. Unless otherwise specified in the Supplementary General Conditions, the CONTRACTOR shall furnish all other lines, grades, and bench marks required for proper execution of the WORK.

B. The CONTRACTOR shall preserve all bench marks, stakes, and other survey marks, and in case of their removal or destruction by any party, the CONTRACTOR shall be responsible for the accurate replacement of such reference points by personnel qualified under the applicable state codes governing land surveyors.

ARTICLE 5 -- BONDS AND INSURANCE

5.1 BONDS

A. The CONTRACTOR shall furnish Performance and Payment Bonds, each in the amount set forth in the Supplementary General Conditions, as security for the faithful performance and payment of all the CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date of Substantial Completion, except as otherwise provided by Law or Regulation or by the Contract Documents. The CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary General Conditions.

B. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Government Financial Operations, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

C. If the surety on any Bond furnished by the CONTRACTOR is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the WORK is located, the CONTRACTOR shall within 7 days thereafter substitute another Bond and surety, which must be acceptable to the OWNER.

D. All Bonds required by the Contract Documents to be purchased and maintained by CONTRACTOR shall be obtained from surety companies that are duly licensed or authorized in the State in which the Project is located to issue Bonds for the limits so required. Such surety companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary General Conditions.

5.2 INSURANCE

A. The CONTRACTOR shall purchase and maintain the insurance required under this Paragraph. Such insurance shall include the specific coverages set out herein and be written for not less than the limits of liability and coverages provided in the Supplementary General Conditions, or required by Laws or Regulations, whichever are greater. All insurance shall be maintained continuously during the life of the Agreement up to the date of Substantial Completion and at all times thereafter when the CONTRACTOR may be correcting, removing, or replacing Defective Work in accordance with Paragraph 13.5. The CONTRACTOR's liabilities under this Agreement shall not be deemed limited in any way to the insurance coverage required.

B. All insurance required by the Contract Documents to be purchased and maintained by the CONTRACTOR shall be obtained from insurance companies that are duly licensed or authorized to issue insurance policies for the limits and coverages so required in the State in which the Project is located. Such insurance companies shall have a current Best's Rating of at least an "A" (Excellent) general policy holder's rating and a Class VII financial size category and shall also meet such additional requirements and qualifications as may be provided in the Supplementary General Conditions.

C. The CONTRACTOR shall furnish the OWNER, with copies to each additional insured who is indicated in the Supplementary General Conditions, with certificates and original endorsements showing the type, amount, class of operations covered, effective dates and dates of expiration of policies. All of the policies of insurance so required to be purchased and maintained (or the certificates or other evidence thereof) shall contain a provision or endorsement that the coverage afforded will not be canceled, reduced in coverage, or renewal refused until at least 30 days' prior written notice has been given to the OWNER and additional insureds by certified mail. All such insurance required herein (except for worker's compensation and employer's liability) shall name the OWNER, the ENGINEER, and their consultants and subconsultants and their officers, directors, agents, and employees as "additional insureds" under the policies. The CONTRACTOR shall purchase and maintain the following insurance:

1. Workers' Compensation and Employer's Liability: This insurance shall protect the CONTRACTOR against all claims under applicable workers' compensation laws or

federal acts, including claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a workers' compensation law. This insurance shall include an "all states" endorsement. In the event of a "monopolistic" state, CONTRACTOR shall certify all employees are covered by the state fund or shall provide a separate policy providing "all states" benefits. Employer's liability "stop gap" coverage for monopolistic states shall be provided under either a worker's compensation policy or general liability policy. The CONTRACTOR shall require each subcontractor similarly to provide workers' compensation insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the CONTRACTOR's workers' compensation insurance. In case any class of employees is not protected under the workers' compensation laws, the CONTRACTOR shall provide and shall cause each Subcontractor to provide adequate employer's liability insurance for the protection of such of its employees as are not otherwise protected. The CONTRACTOR and each Subcontractor shall provide a waiver of subrogation in favor of the OWNER and ENGINEER.

2. Comprehensive or Commercial General Liability: This insurance shall be written in comprehensive form and shall protect the CONTRACTOR against all claims arising from injuries to persons other than its employees or damage to property of the OWNER or others arising out of any act or omission of the CONTRACTOR or its agents, employees, or subcontractors. The policy shall also include protection against claims insured by personal injury liability coverage and contractual coverage to insure the contractual liability assumed by the CONTRACTOR under the indemnification provisions in the General Conditions. To the extent that the CONTRACTOR's work, or work under its direction, may require blasting, explosive conditions, or underground operations, the comprehensive or commercial general liability coverage shall specifically include coverage relative to blasting, explosion, collapse, and/or underground hazards.
3. Commercial Automobile Liability: This insurance shall be written in comprehensive form and shall protect the CONTRACTOR against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, and shall cover operation on or off the Site of all motor vehicles licensed for highway use, whether they are owned, nonowned, or hired.
4. Subcontractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance: The CONTRACTOR shall either require each of the Subcontractors to procure and to maintain subcontractor's public liability and property damage insurance and vehicle liability insurance of the type and in the same amounts specified in the Supplementary General Conditions for the CONTRACTOR or insure the activities of the Subcontractors under the CONTRACTOR's own policies.
5. Builder's Risk:

    a. This insurance shall be of the "all risks" type, shall be written in completed value form, and shall protect the CONTRACTOR, Subcontractors, the OWNER, and the ENGINEER, against risks of damage to buildings, structures, and materials and equipment (including any stored off-site and while in transit), CONTRACTOR'S equipment, debris removal and including demolition and contingent loss occasioned by enforcement of any applicable legal requirements,

and shall cover reasonable compensation for ENGINEER'S services and expenses required as a result of such insured loss. The amount of such insurance shall be not less than the insurable value of the WORK at completion plus equipment. Builder's risk insurance shall provide for losses to be payable to the CONTRACTOR and the OWNER, as their interests may appear. This insurance shall contain a provision that in the event of payment for any loss under the coverage provided, the insurance company shall have no rights of recovery against the CONTRACTOR, the OWNER, and the ENGINEER. This insurance shall insure against all risks of loss (including earthquake, flood and collapse) and, at the option of the OWNER, shall include comprehensive boiler and machinery coverage including coverage for installation and testing.

b. If the OWNER finds it necessary to occupy or use a portion or portions of the Project prior to Substantial Completion thereof, such occupancy shall not commence prior to the time mutually agreed to by the OWNER and CONTRACTOR and to which the insurance company or companies providing the Builder's Risk Insurance have consented by endorsement to the policy or policies.

ARTICLE 6 -- CONTRACTOR'S RESPONSIBILITIES

6.1 COMMUNICATIONS

A. Written communications with the OWNER shall be only through or as directed by the ENGINEER.

6.2 SUPERVISION AND SUPERINTENDENCE

A. The CONTRACTOR shall supervise, inspect, and direct the WORK competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the WORK in accordance with the Contract Documents. The CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction and all safety precautions and programs incidental thereto. The CONTRACTOR shall be responsible to see that the completed WORK complies accurately with the Contract Documents.

B. The CONTRACTOR shall designate in writing and keep on the Site at all times during the performance of the WORK a technically qualified, English-speaking superintendent, who is an employee of the CONTRACTOR and who shall not be replaced without written notice to the OWNER and the ENGINEER. The superintendent will be the CONTRACTOR's representative at the Site and shall have authority to act on behalf of the CONTRACTOR. All communications given to the superintendent shall be as binding as if given to the CONTRACTOR.

C. The CONTRACTOR's superintendent shall be present at the Site at all times while work is in progress and shall be available by phone for emergencies 24 hours per day, 7 days per week. Failure to observe this requirement shall be considered suspension of the

WORK by the CONTRACTOR until such time as such superintendent is again present at the Site.

6.3 LABOR, MATERIALS, AND EQUIPMENT

A. The CONTRACTOR shall provide competent, suitably qualified personnel to survey and lay out the WORK and perform construction as required by the Contract Documents. The CONTRACTOR shall furnish, erect, maintain, and remove the construction plant and any required temporary works. The CONTRACTOR shall at all times maintain good discipline and order at the Site. Except in connection with the safety or protection of persons or the WORK or property at the Site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all work at the Site shall be performed during regular working hours, and the CONTRACTOR will not permit overtime work or the performance of work on Saturday, Sunday, any OWNER'S observed holiday, or any federally observed holiday without the OWNER's written consent. The CONTRACTOR shall apply for this consent through the ENGINEER in writing a minimum of 48 hours in advance.

B. Except as otherwise provided in this Paragraph, the CONTRACTOR shall receive no additional compensation for overtime work, i.e., work in excess of 8 hours in any one calendar day or 40 hours in any one calendar week, even though such overtime work may be required under emergency conditions and may be ordered by the ENGINEER in writing.

C. All increased costs of inspection and testing performed during overtime work by the CONTRACTOR which is allowed solely for the convenience of the CONTRACTOR shall be borne by the CONTRACTOR. The OWNER has the authority to deduct the cost of all such inspection and testing from any partial payments otherwise due to the CONTRACTOR.

D. Unless otherwise specified in the Contract Documents, the CONTRACTOR shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, lubricants, power, light, heat, telephone, water, sanitary facilities, and all other facilities, consumables, and incidentals necessary for the furnishing, performance, testing, start-up, and completion of the WORK.

E. All materials and equipment incorporated into the WORK shall be of specified quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of the OWNER. If required by the ENGINEER, the CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind and quality of materials and equipment. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with the instructions of the applicable Supplier except as otherwise provided in the Contract Documents; but no provisions of any such instructions will be effective to

assign to the OWNER, ENGINEER, or any of their consultants, agents, or employees, any duty or authority to supervise or direct the furnishing or performance of the WORK or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.9 C.

6.4 SCHEDULE

A. The CONTRACTOR shall comply with the schedule requirements in the General Requirements.

6.5 SUBSTITUTES OR "OR EQUAL" ITEMS

A. The CONTRACTOR shall submit proposed substitutes or "or equal" items in accordance with the provisions set forth in the Supplemental General Provisions SGC-6.5.

6.6 CONCERNING SUBCONTRACTORS, SUPPLIERS, AND OTHERS

A. The CONTRACTOR shall be responsible to the OWNER and the ENGINEER for the acts and omissions of its Subcontractors, Suppliers, and their employees to the same extent as CONTRACTOR is responsible for the acts and omissions of its own employees. Nothing contained in this Paragraph shall create any contractual relationship between any Subcontractor and the OWNER or the ENGINEER nor relieve the CONTRACTOR of any liability or obligation under the Contract Documents. The CONTRACTOR shall include these General Conditions and the Supplementary General Conditions as a part of all its subcontract and supply agreements.

6.7 PERMITS

A. Unless otherwise provided in the Supplementary General Conditions, the CONTRACTOR shall obtain and pay for all construction permits and licenses from the agencies having jurisdiction, including the furnishing of insurance and bonds if required by such agencies. The enforcement of such requirements shall not be made the basis for claims for additional compensation by CONTRACTOR. When necessary, the OWNER will assist the CONTRACTOR, in obtaining such permits and licenses. The CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the WORK, which are applicable at the time of opening of Bids. The CONTRACTOR shall pay all charges of utility owners for inspection or connections to the WORK.

6.8 PATENT FEES AND ROYALTIES

A. The CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the WORK or the incorporation in the WORK of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the WORK and if to

the actual knowledge of the OWNER or the ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed by the OWNER in the Contract Documents. The CONTRACTOR's indemnification obligation under this Paragraph 6.7 A. for all claims and liabilities arising out of any infringement of patent rights or copyrights incident to the use in the performance of the WORK or resulting from the incorporation in the WORK of any invention, design, process, product, or device not specified in the Contract Documents shall be in accordance with Paragraph 6.16 of these General Conditions.

6.9 LAWS AND REGULATIONS

A. The CONTRACTOR shall observe and comply with all Laws and Regulations which in any manner affect those engaged or employed on the WORK, the materials used in the WORK, or the conduct of the WORK. If any discrepancy or inconsistency should be discovered between the Contract Documents and any such Laws or Regulations, the CONTRACTOR shall report the same in writing to the ENGINEER. Any particular Law or Regulation specified or referred to elsewhere in the Contract Documents shall not in any way limit the obligation of the CONTRACTOR to comply with all other provisions of federal, state, and local laws and regulations. The CONTRACTOR's indemnification obligations for all claims or liability arising from violation of any such law, ordinance, code, order, or regulation, whether by CONTRACTOR or by its employees, Subcontractors or Suppliers shall be in accordance with Paragraph 6.17 of these General Conditions.

6.10 TAXES

A. The CONTRACTOR shall pay all sales, consumer, use, and other similar taxes required to be paid by the CONTRACTOR in accordance with the laws and regulations of the place of the Project which are applicable during the performance of the WORK.

6.11 USE OF PREMISES

A. The CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site, the land and areas identified in and permitted by the Contract Documents, and the other land and areas permitted by Laws and Regulations, rights-of-way, permits, and easements. The CONTRACTOR shall assume full liability and responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any land or areas contiguous thereto, resulting from the performance of the WORK. Should any claim be made against the OWNER or the ENGINEER by any such owner or occupant because of the performance of the WORK, the CONTRACTOR shall promptly attempt to settle with such other party by agreement or otherwise resolve the claim through litigation at the CONTRACTOR's sole liability expense. The CONTRACTOR's indemnification obligations for all claims and liability, arising directly, indirectly, or consequentially out of any action, legal or equitable, brought by any such owner or occupant against the OWNER, the ENGINEER, their consultants, subconsultants, and the officers, directors, employees and agents of each and

any of them to the extent caused by or based upon the CONTRACTOR's performance of the WORK shall be in accordance with Paragraph 6.17 of these General Conditions.

6.12 SAFETY AND PROTECTION

A. The CONTRACTOR shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the WORK. The CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. All persons at the Site and other persons and organizations who may be affected thereby;
2. All the WORK and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
3. Other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of the performance of the WORK.

B. The CONTRACTOR shall comply with all applicable Laws and Regulations relating to the safety of persons or property or to the protection of persons or property from damage, injury, or loss and shall erect and maintain all necessary safeguards for such safety and protection. The CONTRACTOR shall notify owners of adjacent property and utilities when prosecution of the WORK may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property. CONTRACTOR'S duties and responsibilities for safety and for protection of the WORK shall continue until such time as all the WORK is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with Paragraph 14.7 B. that the WORK is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

C. The CONTRACTOR shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

D. Materials that contain hazardous substances or mixtures may be required on the WORK. A Material Safety Data Sheet shall be made available at the Site by the CONTRACTOR for every hazardous product used.

E. Material usage shall strictly conform to OSHA safety requirements and all manufacturer's warnings and application instructions listed on the Material Safety Data Sheet and on the product container label.

F. The CONTRACTOR shall be responsible for the exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

G. The CONTRACTOR shall notify the ENGINEER if it considers a specified product or its intended use to be unsafe. This notification must be given to the ENGINEER prior to the product being ordered, or if provided by some other party, prior to the product being incorporated in the WORK.

6.13 EMERGENCIES

A. In emergencies affecting the safety or protection of persons or the WORK or property at the Site or adjacent thereto, CONTRACTOR, without special instruction or authorization from OWNER or ENGINEER, is obligated to immediately act to prevent threatened damage, injury, or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the WORK or variations from the Contract Documents have been caused thereby. If ENGINEER determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to such an emergency, a Change Order will be issued to document the consequences of such action.

6.14 SUBMITTALS

A. After checking and verifying all field measurements and after complying with applicable procedures specified in the General Requirements, the CONTRACTOR shall submit to the ENGINEER for review all Shop Drawings.

B. The ENGINEER'S review will be only to determine if the items covered by the submittals will, after installation or incorporation in the WORK, generally conform to the Contract Documents and with the design concept of the completed Project.

C. The CONTRACTOR shall also submit to the ENGINEER for review all Samples in accordance with the accepted schedule of Sample submittals.

D. Before submittal of each Shop Drawing or Sample, the CONTRACTOR shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar data with respect thereto and reviewed or coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the WORK and the Contract Documents. The CONTRACTOR shall provide submittals in accordance with the requirements of Submittal Requirements.

6.15 CONTINUING THE WORK

A. The CONTRACTOR shall carry on the WORK and adhere to the progress schedule during all disputes or disagreements with the OWNER. No WORK shall be delayed or postponed pending resolution of any disputes or disagreements, except as the CONTRACTOR and the OWNER may otherwise agree in writing.

6.16 CONTRACTOR'S GENERAL WARRANTY AND GUARANTEE

A. CONTRACTOR warrants and guarantees that all WORK will be in accordance with the Contract Documents and will not be defective. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

1. Abuse, modification, or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, or Suppliers, or any other individual or entity for which CONTRACTOR is responsible;
2. Normal wear and tear under normal usage.

B. CONTRACTOR's obligation to perform and complete the WORK in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of WORK that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the WORK in accordance with the Contract Documents:

1. Observations by ENGINEER;
2. Recommendation by ENGINEER or payment by OWNER of any progress or final payment;
3. The issuance of a Certificate of Completion by the OWNER;
4. Use or occupancy of the WORK or any part thereof by the OWNER;
5. Any acceptance by OWNER or any failure to do so;
6. Any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice or acceptability by ENGINEER pursuant to Paragraph 14.7 B.;
7. Any inspection, test, or approval by others; or
8. Any correction of Defective Work by OWNER.

6.17 INDEMNIFICATION

A. To the fullest extent permitted by Laws and Regulations, the CONTRACTOR shall indemnify, defend, and hold harmless the OWNER, the ENGINEER, their consultants, subconsultants, and the officers, directors, employees, and agents of each and any of them, against and from all claims and liability arising under, by reason of, related, or incidental to the Contract Documents or any performance of the WORK, but not from the sole negligence or willful misconduct of the OWNER and/or the ENGINEER. Such indemnification by the CONTRACTOR shall include, but not be limited to, the following:

1. Liability or claims resulting directly or indirectly from the negligence or carelessness of the CONTRACTOR, its employees, or agents in the performance of the WORK, or in guarding or maintaining the same, or from any improper materials, implements, or appliances used in its construction, or by or on account of any act or omission of the CONTRACTOR, its employees, or agents;
2. Liability or claims arising directly or indirectly from bodily injury, occupational sickness or disease, or death of the CONTRACTOR's, Subcontractor's, or Supplier's

own employees, or agents engaged in the WORK resulting in actions brought by or on behalf of such employees against the OWNER and/or the ENGINEER;

3. Liability or claims arising directly or indirectly from or based on the violation of any Laws or Regulations, whether by the CONTRACTOR, its employees, or agents;
4. Liability or claims arising directly or indirectly from the use or manufacture by the CONTRACTOR, its employees, or agents in the performance of this Agreement of any copyrighted or uncopyrighted composition, secret process, patented or unpatented invention, article, or appliance, unless otherwise specifically stipulated in this Agreement;
5. Liability or claims arising directly or indirectly from the breach of any warranties, whether express or implied, made to the OWNER and/or ENGINEER or any other parties by the CONTRACTOR, its employees, or agents;
6. Liability or claims arising directly or indirectly from the willful misconduct of the CONTRACTOR, its employees, or agents;
7. Liability or claims arising directly or indirectly from any breach of the obligations assumed in this Agreement by the CONTRACTOR;
8. Liability or claims arising directly or indirectly from, relating to, or resulting from a hazardous condition created by the CONTRACTOR, Subcontractors, Suppliers, or any of their employees or agents, and;
9. Liability or claims arising directly, or indirectly, or consequentially out of any action, legal or equitable, brought against the OWNER, the ENGINEER, their consultants, subconsultants, and the officers, directors, employees and agents of each or any of them, to the extent caused by the CONTRACTOR's use of any premises acquired by permits, rights of way, or easements, the Site, or any land or areas contiguous thereto or its performance of the WORK thereon.

B. The CONTRACTOR shall reimburse the OWNER and the ENGINEER for all costs and expenses, (including but not limited to fees and charges of engineers, architects, attorneys, and other professionals and court costs including all costs of appeals) incurred by said OWNER and ENGINEER in enforcing the provisions of this Paragraph 6.17.

C. The indemnification obligation under this Paragraph 6.17 shall not be limited in any way by any limitation on the amount or type of insurance carried by CONTRACTOR or by the amount or type of damages, compensation, or benefits payable by or for the CONTRACTOR or any Subcontractor or other person or organization under workers' compensation acts, disability benefit acts, or other employee benefit acts.

6.18 CONTRACTOR'S DAILY REPORTS

A. The CONTRACTOR shall complete a daily report indicating location worked, total manpower for each construction trade, major equipment on Site, each Subcontractor's manpower and equipment, weather conditions, and other related information involved in the performance of the WORK. The daily report shall be completed on forms furnished by the ENGINEER, and shall be submitted to the ENGINEER at the conclusion of each workday. The daily report shall comment on the daily progress and status of each major component of the WORK. These components will be decided by the ENGINEER.

ARTICLE 7 -- OTHER WORK

7.1 RELATED WORK AT SITE

A. The OWNER may perform other work related to the Project at the Site by the OWNER's own forces, have other work performed by utility owners, or let other direct contracts for such other work. If the fact that such other work is to be performed was not noted in the Contract Documents, written notice thereof will be given to the CONTRACTOR prior to starting any such other work.

B. The CONTRACTOR shall afford each person who is performing the other work (including the OWNER's employees) proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the WORK with theirs. The CONTRACTOR shall do all cutting, fitting, and patching of the WORK that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. The CONTRACTOR shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of the ENGINEER and the others whose work will be affected.

C. If the proper execution or results of any part of the CONTRACTOR's work depends upon such other work by another, the CONTRACTOR shall inspect and report to the ENGINEER in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for such proper execution and results. The CONTRACTOR's failure to report such delays, defects, or deficiencies will constitute an acceptance of the other work as fit and proper for integration with the CONTRACTOR's work except for latent or nonapparent defects and deficiencies in the other work.

7.2 COORDINATION

A. If the OWNER contracts with others for the performance of other work at the Site, OWNER will have sole authority and responsibility in respect of such coordination unless otherwise provided in the Supplementary General Conditions.

ARTICLE 8 -- OWNER'S RESPONSIBILITIES

8.1 COMMUNICATIONS

A. Except as may be otherwise provided in these General Conditions or the Supplementary General Conditions, the OWNER will issue all its communications to the CONTRACTOR through the ENGINEER.

8.2 PAYMENTS

A. The OWNER will make payments to the CONTRACTOR as provided in Article 14.

8.3 LANDS, EASEMENTS, AND SURVEYS

A. The OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.1 and 4.6.

8.4 REPORTS AND DRAWINGS

A. The OWNER will identify and make available to the CONTRACTOR copies of reports of physical conditions at the Site and drawings of existing structures which have been utilized in preparing the Contract Documents as set forth in Paragraph 4.2.

8.5 CHANGE ORDERS

A. The OWNER will execute Change Orders as indicated in Article 10.

8.6 INSPECTIONS AND TESTS

A. The OWNER's responsibility for inspections and tests is set forth in Paragraph 13.3.

8.7 SUSPENSION OF WORK

A. The OWNER's right to stop work or suspend work is set forth in Paragraphs 13.4 and 15.1.

8.8 TERMINATION OF AGREEMENT

A. The OWNER's right to terminate services of the CONTRACTOR is set forth in Paragraphs 15.2 and 15.3.

8.9 LIMITATION ON OWNER'S RESPONSIBILITIES

A. The OWNER shall not supervise, direct or have control or authority over, nor be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the WORK. OWNER will not be responsible for CONTRACTOR's failure to perform or furnish the WORK in accordance with the Contract Documents.

8.10 UNDISCLOSED HAZARDOUS ENVIRONMENTAL CONDITIONS

A. OWNER's responsibility in respect to an undisclosed hazardous environmental condition is set forth in Paragraph 4.5.

ARTICLE 9 -- ENGINEER'S STATUS DURING CONSTRUCTION

9.1 OWNER'S REPRESENTATIVE

A. The ENGINEER will be the OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of the ENGINEER as the OWNER's representative during construction are set forth in the Contract Documents.

9.2 OBSERVATIONS ON THE SITE

A. The ENGINEER will make observations on the Site during construction to monitor the progress and quality of the WORK and to determine, in general, if the WORK is proceeding in accordance with the Contract Documents. The ENGINEER will not be required to make exhaustive or continuous inspections to check the quality or quantity of the WORK.

9.3 PROJECT REPRESENTATION

A. The ENGINEER may furnish a Resident Project Representative to assist in observing the performance of the WORK. The duties, responsibilities, and limitations of authority of any such Resident Project Representative will be as provided in the Supplementary General Conditions.

9.4 CLARIFICATIONS

A. The ENGINEER will issue with reasonable promptness such written Clarifications of the requirements of the Contract Documents as the ENGINEER may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents.

9.5 AUTHORIZED VARIATIONS IN WORK

A. The ENGINEER may authorize variations in the WORK from the requirements of the Contract Documents. These may be accomplished by a Field Order and will require the CONTRACTOR to perform the WORK involved in a manner that minimizes the impact to the WORK and the Contract Times. If the CONTRACTOR believes that a Field Order justifies an increase in the Contract Price or an extension of the Contract Times, the CONTRACTOR may make a claim therefor as provided in Article 11 or 12.

9.6 REJECTING DEFECTIVE WORK

A. The ENGINEER will have authority to reject Defective Work and will also have authority to require special inspection or testing of the WORK as provided in Article 13.

9.7 CONTRACTOR SUBMITTALS, CHANGE ORDERS, AND PAYMENTS

A. In accordance with the procedures set forth in the General Requirements, the ENGINEER will review all CONTRACTOR submittals.

B. The ENGINEER's responsibilities for Change Orders are set forth in Articles 10, 11, and 12.

C. The ENGINEER's responsibilities for Applications for Payment are set forth in Article 14.

9.8 DECISIONS ON DISPUTES

A. The ENGINEER will be the initial interpreter of the requirements of the Contract Documents and of the acceptability of the WORK thereunder. Claims, disputes, and other matters relating to the acceptability of the WORK and interpretation of the requirements of the Contract Documents pertaining to the performance of the WORK shall be determined by the ENGINEER. Any claims in respect to changes in the Contract Price or Contract Times shall be resolved in accordance with the requirements set forth in Articles 10, 11, and 12.

B. Dispute Resolution Methods and Procedures
   a. Either Owner or Contractor may request mediation of any Claim submitted to the Engineer for a decision under paragraph 9.8(A) before such decision becomes final and binding. **The non-binding mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association**. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract.
   b. Owner and Contractor shall participate in the mediation process in good faith. **The mediator shall be agreed upon by both parties, subject to OWNER'S Board approval**. The process shall be concluded within 60 days of filing the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
   c. If the Claim is not resolved by mediation, Engineer's action under Paragraph 9.8(A), within 30 days after termination of the mediation, Owner or Contractor may:
      i. Elect in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or
      ii. Agree with the other party to submit the Claim to another dispute resolution process; or
      iii. Give written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

9.9 LIMITATION ON ENGINEER'S RESPONSIBILITIES

A. Neither the ENGINEER's authority to act under this Article 9 or other provisions of the Contract Documents nor any decision made by the ENGINEER in good faith either to

exercise or not exercise such authority shall give rise to any duty or responsibility of the ENGINEER to the CONTRACTOR, any Subcontractor, any Supplier, any surety for any of them, or any other person or organization performing any of the WORK.

B. Whenever in the Contract Documents the terms "as ordered," "as directed," "as required," "as allowed," "as reviewed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," or "satisfactory," or adjectives of like effect or import are used to describe a requirement, direction, review, or judgment of the ENGINEER as to the WORK, it is intended that such requirement, direction, review, or judgment will be solely to evaluate the WORK for compliance with the requirements of the Contract Documents, and conformance with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents, unless there is a specific statement indicating otherwise. The use of any such term or adjective shall not be effective to assign to the ENGINEER any duty or authority to supervise or direct the performance of the WORK or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.9 C.

C. The ENGINEER will not supervise, direct, control, or have authority over or be responsible for the CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of the CONTRACTOR to comply with Laws and Regulations applicable to the performance of the WORK. The ENGINEER will not be responsible for the CONTRACTOR's failure to perform the WORK in accordance with the Contract Documents. The ENGINEER will not be responsible for the acts or omissions of the CONTRACTOR nor of any Subcontractor, Supplier, or any other person or organization performing any of the WORK.

ARTICLE 10-- CHANGES IN THE WORK

10.1 GENERAL

A. Without invalidating the Agreement and without notice to any surety, the OWNER may at any time or from time to time, order additions, deletions, or revisions in the WORK. Such additions, deletions or revisions will be authorized by a Change Order or Field Order. Upon receipt of any such document, CONTRACTOR shall promptly proceed to implement the additions, deletions, or revisions in the WORK in accordance with the applicable conditions of the Contract Documents.

B. The CONTRACTOR shall not be entitled to an increase in the Contract Price nor an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented by Change Order, except in the case of an emergency and except in the case of uncovering work as provided in Paragraph 13.3.F and G.

C. The OWNER and the CONTRACTOR shall execute appropriate Change Orders covering:

1. Changes in the WORK which are ordered by the OWNER pursuant to Paragraph 10.1 A.;
2. Changes required because of acceptance of Defective Work under Paragraph 13.6; and
3. Changes in the Contract Price or Contract Times which are agreed to by the parties under Articles 11 and/or 12, respectively.

D. If notice of any change in the WORK is required to be given to a surety, the giving of any such notice shall be the CONTRACTOR's responsibility. If the change in the WORK affects the Contract Price, the OWNER may require an adjustment to the amount of any applicable Bond and the amount of each applicable Bond shall be adjusted accordingly.

E. If the OWNER and CONTRACTOR agree as to the extent, if any, of an increase in the Contract Price or an extension or shortening of the Contract Times that should be allowed as a result of a Field Order, the CONTRACTOR shall proceed so as to minimize the impact on and delays to the WORK pending the issuance of a Change Order.

F. If the OWNER and the CONTRACTOR are unable to agree as to the extent, if any, of an increase in the Contract Price or an extension or shortening of the Contract Times that should be allowed as a result of a Field Order, the ENGINEER can direct the CONTRACTOR to proceed on the basis of time and materials so as to minimize the impact on and delays to the WORK, and the CONTRACTOR may make a claim as provided in Articles 11 and 12.

10.2 ALLOWABLE QUANTITY VARIATIONS

A. In the event of an increase or decrease in the quantity of any bid item under a unit price contract, the total amount of work actually done or materials or equipment furnished will be paid for according to the unit price established for such work under the Contract Documents, wherever such unit price has been established; provided, that an adjustment in the Contract Price may be made for changes which result in an increase or decrease in excess of 25 percent of the estimated quantity of any unit price bid item of the WORK.

B. In the event a part of the WORK is to be entirely eliminated and no lump sum or unit price is named in the Contract Documents to cover such eliminated work, the price of the eliminated work shall be agreed upon by the OWNER and the CONTRACTOR by Change Order.

ARTICLE 11 -- CHANGE OF CONTRACT PRICE

11.1 GENERAL

A. The Contract Price constitutes the total compensation payable to the CONTRACTOR for performing the WORK. All duties, responsibilities, and obligations assigned to or undertaken by the CONTRACTOR to complete the WORK shall be at its expense without change in the Contract Price.

B. The Contract Price may only be changed by a Change Order. The value of any work covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:

1. Where the work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved.
2. By mutual acceptance of a lump sum, which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.4; or
3. On the basis of the cost of work (determined as provided in Paragraph 11.3) plus the CONTRACTOR's overhead and profit (determined as provided in Paragraph 11.4).

C. Any claim for an increase in the Contract Price shall be based on written notice delivered by the CONTRACTOR to the ENGINEER promptly (but in no event later than 10 days) after the start of the event giving rise to the claim and shall state the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered within 60 days after the start of such event (unless the ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the CONTRACTOR's written statement that the amount claimed covers all known amounts (direct, indirect, and consequential) to which the CONTRACTOR is entitled as a result of such event. All claims for adjustment in the Contract Price will be determined by the ENGINEER. No claim for an adjustment in the Contract Price will be valid if not submitted in accordance with this Paragraph 11.1 C.

11.2 COSTS RELATING TO WEATHER

A. The CONTRACTOR shall have no claims against the OWNER for damages for any injury to work, materials, or equipment, resulting from the action of the elements. If, however, in the opinion of the ENGINEER, the CONTRACTOR has made all reasonable efforts to protect the materials, equipment, and work, the CONTRACTOR may be granted a reasonable extension of Contract Times to make proper repairs, renewals, and replacements of the work, materials, or equipment.

11.3 COST OF WORK (BASED ON TIME AND MATERIALS)

A. General: The term "cost of work" means the sum of all costs necessarily incurred and paid by the CONTRACTOR for labor, materials, and equipment in the proper performance of extra work. Except as otherwise may be agreed to in writing by the OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in Paragraph 11.5.

B. Labor: The costs of labor will be the actual cost for wages prevailing for each craft or type of workers performing the extra work at the time the extra work is done, plus employer payments of payroll taxes, workers compensation insurance, liability insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from federal, state or local laws, as well as assessments or benefits required by

lawful collective bargaining agreements. Labor costs for equipment operators and helpers will be paid only when such costs are not included in the invoice for equipment rental. The labor costs for foremen shall be proportioned to all of their assigned work and only that applicable to extra work shall be paid. Nondirect labor costs including superintendence shall be considered part of the markup set out in Paragraph 11.4.

C. Materials: The cost of materials reported shall be at invoice or lowest current price at which materials are locally available and delivered to the Site in the quantities involved, plus the cost of freight, delivery and storage, subject to the following:

1. All trade discounts and rebates shall accrue to the OWNER, and the CONTRACTOR shall make provisions so that they may be obtained;
2. For materials secured by other than a direct purchase and direct billing to the purchaser, the cost shall be deemed to be the price paid to the actual supplier as determined by the ENGINEER. Except for actual costs incurred in the handling of such materials, markup will not be allowed;
3. Payment for materials from sources owned wholly or in part by the purchaser shall not exceed the price paid by the purchaser for similar materials from said sources on extra work items or the current wholesale price for such materials delivered to the Site, whichever price is lower; and
4. If in the opinion of the ENGINEER the cost of material is excessive, or the CONTRACTOR does not furnish satisfactory evidence of the cost of such material, then the cost shall be deemed to be the lowest current wholesale price for the quantity concerned delivered to the Site less trade discount. The OWNER reserves the right to furnish materials for the extra work and no claim will be allowed by the CONTRACTOR for costs and profit on such materials.

D. Equipment: The CONTRACTOR will be paid for the use of equipment at the rental rate listed for such equipment specified in the Supplementary General Conditions. Such rental rate will be used to compute payments for equipment whether the equipment is under the CONTRACTOR's control through direct ownership, leasing, renting, or another method of acquisition. The rental rate to be applied for use of each item of equipment will be the rate resulting in the least total cost to the OWNER for the total period of use. If it is deemed necessary by the CONTRACTOR to use equipment not listed in the publication specified in the Supplementary General Conditions, an equitable rental rate for the equipment will be established by the ENGINEER. The CONTRACTOR may furnish cost data which might assist the ENGINEER in the establishment of the rental rate. Payment for equipment shall be subject to the following:

1. All equipment shall, in the opinion of the ENGINEER, be in good working condition and suitable for the purpose for which the equipment is to be used;
2. Before construction equipment is used on the extra work, the CONTRACTOR shall plainly stencil or stamp an identifying number thereon at a conspicuous location, and shall furnish to the ENGINEER, in duplicate, a description of the equipment and its identifying number;

3. Unless otherwise specified, manufacturer's ratings and manufacturer approved modifications shall be used to classify equipment for the determination of applicable rental rates. Equipment which has no direct power unit shall be powered by a unit of at least the minimum rating recommended by the manufacturer;
4. Individual pieces of equipment or tools having a replacement value of $500 or less, whether or not consumed by use, will be considered to be small tools and no payment will be made therefore.

E. Equipment Rental Time: The rental time to be paid for equipment on the Site will be the time the equipment is in productive operation on the extra work being performed and, in addition, will include the time required to move the equipment to the location of the extra work and return it to the original location or to another location requiring no more time than that required to return it to its original location; except, that moving time will not be paid if the equipment is used on other than the extra work, even though located at the Site of the extra work. Loading and transporting costs will be allowed, in lieu of moving time, when the equipment is moved by means other than its own power, except that no payment will be made for loading and transporting costs when the equipment is used at the Site of the extra work on other than the extra work. Rental time will not be allowed while equipment is inoperative due to breakdowns. The rental time of equipment on the work Site will be computed subject to the following:

1. When hourly rates are listed, any part of an hour less than 30 minutes of operation will be considered to be half-hour of operation, and any part of an hour in excess of 30 minutes will be considered one hour of operation;
2. When daily rates are listed, any part of a day less than 4 hours operation will be considered to be half-day of operation. When owner-operated equipment is used to perform extra work to be paid for on a time and materials basis, the CONTRACTOR will be paid for the equipment and operator, as set forth in Paragraphs 3, 4, and 5, following;
3. Payment for the equipment will be made in accordance with the provisions in Paragraph 11.3 D., herein;
4. Payment for the cost of labor and subsistence or travel allowance will be made at the rates paid by the CONTRACTOR to other workers operating similar equipment already on the Site, or in the absence of such labor, established by collective bargaining agreements for the type of workmen and location of the extra work, whether or not the operator is actually covered by such an agreement. A labor surcharge will be added to the cost of labor described herein in accordance with the provisions of Paragraph 11.3 B., herein, which surcharge shall constitute full compensation for payments imposed by state and federal laws and all other payments made to or on behalf of workers other than actual wages; and
5. To the direct cost of equipment rental and labor, computed as provided herein, will be added the allowances for equipment rental and labor as provided in Paragraph 11.4, herein.

F. Special Services: Special work or services are defined as that work characterized by extraordinary complexity, sophistication, innovation, or a combination of the foregoing

attributes which are unique to the construction industry. The ENGINEER will make estimates for payment for special services and may consider the following:

1. When the ENGINEER and the CONTRACTOR, determine that a special service or work is required which cannot be performed by the forces of the CONTRACTOR or those of any of its Subcontractors, the special service or work may be performed by an entity especially skilled in the work to be performed. After validation of invoices and determination of market values by the ENGINEER, invoices for special services or work based upon the current fair market value thereof may be accepted without complete itemization of labor, material, and equipment rental costs;
2. When the CONTRACTOR is required to perform work necessitating special fabrication or machining process in a fabrication or a machine shop facility away from the Site, the charges for that portion of the work performed at the off-site facility may, by agreement, be accepted as a special service and accordingly, the invoices for the work may be accepted without detailed itemization; and
3. All invoices for special services will be adjusted by deducting all trade discounts. In lieu of the allowances for overhead and profit specified in Paragraph 11.4, herein, an allowance of 15 percent will be added to invoices for special services.

G. Sureties: All work performed hereunder shall be subject to all of the provisions of the Contract Documents and the CONTRACTOR's sureties shall be bound with reference thereto as under the original Agreement. Copies of all amendments to Bonds or supplemental Bonds shall be submitted to the OWNER for review prior to the performance of any work hereunder.

11.4 CONTRACTOR'S OVERHEAD AND PROFIT

A. Extra work ordered on the basis of time and materials will be paid for at the actual necessary cost as determined by the ENGINEER, plus allowances for overhead and profit. The allowance for overhead and profit will include full compensation for superintendence, taxes, field office expense, extended overhead, home office overhead, and all other items of expense or cost not included in the cost of labor, materials, or equipment provided for under Paragraph 11.3. The allowance for overhead and profit will be made in accordance with the following schedule:

Overhead and Profit Allowance	
Labor	10 percent
Materials	10 percent
Equipment	10 percent

To the sum of the costs and markups provided for in this Article, an additional 2 percent of the sum will be added as compensation for Bonds and insurance.

B. It is understood that labor, materials, and equipment for extra work may be furnished by the CONTRACTOR or by the Subcontractor on behalf of the CONTRACTOR. When all

or any part of the extra work is performed by a Subcontractor, the allowance specified herein will be applied to the labor, materials, and equipment costs of the Subcontractor, to which the CONTRACTOR may add 5 percent of the Subcontractor's total cost for the extra work. Regardless of the number of hierarchical tiers of Subcontractors, the 5 percent increase above the Subcontractor's total cost which includes the allowances for overhead and profit specified herein may be applied one time only .

11.5 EXCLUDED COSTS

A. The term "cost of the work" shall not include any of the following:

1. Payroll costs and other compensation of CONTRACTOR's officers, executives, proprietors, partners, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by CONTRACTOR whether at the Site or in CONTRACTOR's principal or a branch office for general administration of the WORK all of which are to be considered administrative costs covered by the CONTRACTOR's allowance for overhead and profit;
2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site;
3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the WORK and charges against CONTRACTOR for delinquent payments;
4. Cost of premiums for all Bonds and for all insurance whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the same (except as provided by Paragraph 11.4 above);
5. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of Defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property; and
6. Other overhead or general expense costs of any kind and the cost of any item not specifically and expressly included in Paragraph 11.4.

11.6 CONTRACTOR'S EXTRA WORK REPORT

A. In order to be paid for extra work, the CONTRACTOR must submit a daily extra work report on the form furnished by the ENGINEER. The form must be completely filled out based on the provisions of Paragraphs 11.3 through 11.5 and signed by the CONTRACTOR and ENGINEER at the end of each work day. Failure to complete the form and obtain appropriate signatures by the next working day after the extra work of the previous day was completed will result in CONTRACTOR's costs for extra work being disallowed.

ARTICLE 12-- CHANGE OF CONTRACT TIMES

12.1 GENERAL

A. The Contract Times may only be changed by a Change Order. Any claim for an extension of the Contract Times shall be based on written notice delivered by the CONTRACTOR to the ENGINEER promptly (but in no event later than 10 days) after the start of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within 30 days after the start of such event (unless the ENGINEER allows an additional period of time for the submission of additional or more accurate data in support of the claim) and shall be accompanied by the CONTRACTOR's written statement that the adjustment claimed is the entire adjustment to which the CONTRACTOR is entitled as a result of said event. All claims for adjustment in the Contract Times will be determined by the ENGINEER. No claim for an adjustment in the Contract Times will be valid if not submitted in accordance with the requirements of this Paragraph 12.1 A. An increase in Contract Times does not mean that the CONTRACTOR is due an increase in Contract Price. Only compensable time extensions will result in an increase in Contract Price.

B. All time limits stated in the Contract Documents are of the essence of the Agreement.

C. When CONTRACTOR is prevented from completing any part of the WORK within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost on the critical path of the WORK due to such delay, if a claim is made therefor as provided in Paragraph 12.1.A. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by OWNER; acts or neglect of those performing other work as contemplated by Article 7; and fires, floods, epidemics, abnormal weather conditions, or acts of God. Delays attributable to and within the control of any Subcontractor or Supplier shall be deemed to be delays within the control of the CONTRACTOR.

D. In no event will OWNER be liable to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them, for any increase in the Contract Price or other damages arising out or resulting from the following:

1. Delays caused by or within the control of CONTRACTOR; or
2. Delays beyond the control of both OWNER and CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts or neglect by those performing other work as contemplated by Article 7.

12.2 EXTENSIONS OF CONTRACT TIMES FOR DELAY DUE TO WEATHER

A. The CONTRACTOR's construction schedule shall anticipate delay due to unusually severe weather.

B. Contract Times may be extended by the ENGINEER because of delays in excess of the anticipated delay. The CONTRACTOR shall, within 10 days of the beginning of any such delay, notify the ENGINEER in writing and request an extension of Contract Times.

The ENGINEER will ascertain the facts and the extent of the delay and extend the Contract Times when, in its judgement, the findings of the fact justify such an extension.

ARTICLE 13 -- INSPECTIONS AND TESTS; CORRECTION, REMOVAL, OR ACCEPTANCEOF DEFECTIVE WORK

13.1 NOTICE OF DEFECTIVE WORK

A. Prompt notice of Defective Work known to the OWNER or ENGINEER will be given to the CONTRACTOR. All Defective Work, whether or not in place, may be rejected, corrected, or accepted as provided in this Article 13. Defective Work may be rejected even if approved by prior inspection.

13.2 ACCESS TO WORK

A. OWNER, ENGINEER, their consultants, subconsultants, other representatives and personnel of OWNER, independent testing laboratories, and governmental agencies with jurisdictional interests shall have access to the WORK at reasonable times for their observation, inspecting, and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's Site safety procedures and programs so that they may comply therewith as applicable.

13.3 INSPECTIONS AND TESTS

A. The CONTRACTOR shall give the ENGINEER not less than 24 hours notice of readiness of the WORK for all required inspections, tests, or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. The OWNER shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. For inspection, tests, or approvals covered by Paragraphs 13.3C. and 13.3D. below;
2. That costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.3G. shall be paid as provided in said Paragraph 13.3G.; and
3. As otherwise provided in the Contract Documents.

C. If Laws and Regulations of any public body having jurisdiction require any WORK (or any part thereof) to be inspected, tested, or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests or approvals; pay all costs in connection therewith; and furnish the ENGINEER the required certificates of inspection or approval.

D. The CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for the ENGINEER's acceptance of materials or equipment to be incorporated in the WORK or acceptance of materials, mix designs, or equipment submitted for approval prior to the

CONTRACTOR's purchase thereof for incorporation in the WORK. Such inspections, tests, or approvals shall be performed by organizations acceptable to the ENGINEER.

E. The ENGINEER will make, or have made, such inspections and tests as the ENGINEER deems necessary to see that the WORK is being accomplished in accordance with the requirements of the Contract Documents. Unless otherwise specified in the Supplementary General Conditions, the cost of such inspection and testing will be borne by the OWNER. In the event such inspections or tests reveal non-compliance with the requirements of the Contract Documents, the CONTRACTOR shall bear the cost of corrective measures deemed necessary by the ENGINEER, as well as the cost of subsequent reinspection and retesting. Neither observations by the ENGINEER nor inspections, tests, or approvals by others shall relieve the CONTRACTOR from the CONTRACTOR's obligation to perform the WORK in accordance with the Contract Documents.

F. If any WORK (including the work of others) that is to be inspected, tested, or approved is covered without written concurrence of the ENGINEER, it must, if requested by the ENGINEER, be uncovered for observation. Such uncovering shall be at the CONTRACTOR's expense unless the CONTRACTOR has given the ENGINEER not less than 24 hours notice of the CONTRACTOR's intention to perform such test or to cover the same and the ENGINEER has not acted with reasonable promptness in response to such notice.

G. If any WORK is covered contrary to the written request of the ENGINEER, it must, if requested by the ENGINEER, be uncovered for the ENGINEER's observation and recovered at the CONTRACTOR's expense.

H. If the ENGINEER considers it necessary or advisable that covered WORK be observed by the ENGINEER or inspected or tested by others, the CONTRACTOR, at the ENGINEER's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as the ENGINEER may require, that portion of the WORK in question, furnishing all necessary labor, material, and equipment. If it is found that such work is Defective Work, the CONTRACTOR shall bear all direct, indirect, and consequential costs and damages of such uncovering, exposure, observation, inspection, and testing and of satisfactory reconstruction, including but not limited to, fees and charges of engineers, architects, attorneys, and other professionals. However, if such work is not found to be Defective Work, the CONTRACTOR will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, and reconstruction; and, if the parties are unable to agree as to the amount or extent thereof, the CONTRACTOR may make a claim therefor as provided in Articles 11 and 12.

13.4 OWNER MAY STOP THE WORK

A. If Defective Work is identified, the OWNER may order the CONTRACTOR to stop performance of the WORK, or any portion thereof, until the cause for such order has

been eliminated; however, this right of the OWNER to stop the WORK shall not give rise to any duty on the part of the OWNER to exercise this right for the benefit of the CONTRACTOR or any other party.

13.5 CORRECTION OR REMOVAL OF DEFECTIVE WORK

A. If required by the ENGINEER, the CONTRACTOR shall promptly either correct all Defective Work, whether or not fabricated, installed, or completed, or, if the work has been rejected by the ENGINEER, remove it from the Site and replace it with non-defective WORK. The CONTRACTOR shall bear all direct, indirect, and consequential costs and damages of such correction or removal, including but not limited to fees and charges of engineers, architects, attorneys, and other professionals made necessary thereby.

13.6 ACCEPTANCE OF DEFECTIVE WORK

A. If, instead of requiring correction or removal and replacement of Defective Work, the OWNER prefers to accept the Defective Work, the OWNER may do so. The CONTRACTOR shall bear all direct, indirect, and consequential costs attributable to the OWNER's evaluation of and determination to accept such Defective Work. If any such acceptance occurs prior to final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the WORK, and the OWNER shall be entitled to an appropriate decrease in the Contract Price.

13.7 OWNER MAY CORRECT DEFECTIVE WORK

A. If the CONTRACTOR fails within a reasonable time after written notice from the ENGINEER to correct Defective Work, or to remove and replace Defective Work as required by the ENGINEER in accordance with Paragraph 13.5A., or if the CONTRACTOR fails to perform the WORK in accordance with the Contract Documents, or if the CONTRACTOR fails to comply with any other provision of the Contract Documents, the OWNER may, after seven days written notice to the CONTRACTOR, correct and remedy any such deficiency.

B. In exercising the rights and remedies under this paragraph, the OWNER shall proceed with corrective and remedial action. In connection with such corrective and remedial action, the OWNER may exclude the CONTRACTOR from all or part of the Site, take possession of all or part of the WORK, and suspend the CONTRACTOR's services related thereto and incorporate in the WORK all materials and equipment for which the OWNER has paid the CONTRACTOR whether stored at the Site or elsewhere. The CONTRACTOR shall provide the OWNER, OWNER's representatives, ENGINEER, and ENGINEER's consultants access to the Site to enable OWNER to exercise the rights and remedies under this paragraph.

C. All direct, indirect, and consequential costs and damages incurred by the OWNER in exercising the rights and remedies under this paragraph will be charged against the CONTRACTOR and a Change Order will be issued incorporating the necessary revisions

in the Contract Documents with respect to the WORK; and the OWNER shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, the OWNER may make a claim therefor as provided in Article 11. Such claim will include, but not be limited to, all costs of repair or replacement of work of others, destroyed or damaged by correction, removal, or replacement of CONTRACTOR's Defective Work and all direct, indirect, and consequential damages associated therewith.

D. The CONTRACTOR shall not be allowed an extension of Contract Times (or Milestones) because of any delay in the performance of the WORK attributable to the exercise by OWNER of OWNER's rights and remedies under this paragraph.

13.8 CORRECTION PERIOD

A. The correction period for Defective Work shall be the longer of:

1. One year after the date of final acceptance;
2. Such time as may be prescribed by Laws and Regulations;
3. Such time as specified by the terms of any applicable special guarantee required by the Contract Documents; or
4. Such time as specified by any specific provision of the Contract Documents.

B. If, during the correction period as defined in Paragraph 13.8A above, any work is found to be Defective Work, the OWNER shall have the same remedies as set forth in Paragraphs 13.5, 13.6, and 13.7 above.

C. Where Defective Work (and damage to other work resulting therefrom) has been corrected, removed, or replaced under this paragraph, the correction period hereunder with respect to such work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

ARTICLE 14-- PAYMENTS TO CONTRACTOR AND COMPLETION

14.1 SCHEDULE OF VALUES (LUMP SUM PRICE BREAKDOWN)

A. The schedule of values or lump sum price breakdown established as provided in the General Requirements shall serve as the basis for progress payments and shall be incorporated into a form of Application for Payment acceptable to the ENGINEER.

14.2 UNIT PRICE BID SCHEDULE

A. Progress payments on account of unit price work will be based on the number of units completed.

14.3 APPLICATION FOR PROGRESS PAYMENT

A. Unless otherwise prescribed by law, on the 25th of each month, the CONTRACTOR shall submit to the ENGINEER for review, the Application for Payment filled out and signed by the CONTRACTOR covering the WORK completed as of the date of the Application for Payment and accompanied by such supporting documentation as is required by the Contract Documents.

B. The Application for Payment shall identify, as a subtotal, the amount of the CONTRACTOR total earnings to date; plus the value of materials stored at the Site which have not yet been incorporated in the WORK; and less a deductive adjustment for materials installed which were not previously incorporated in the WORK, but for which payment was allowed under the provisions for payment for materials stored at the Site, but not yet incorporated in the WORK.

C. The net payment due the CONTRACTOR shall be the above-mentioned subtotal from which shall be deducted the amount of retainage specified in the Supplementary General Conditions and the total amount of all previous payments made to the CONTRACTOR.

D. The value of materials stored at the Site shall be an amount equal to the specified percent of the value of such materials as set forth in the Supplementary General Conditions. Said amount shall be based upon the value of all acceptable materials and equipment not incorporated in the WORK but delivered and suitably stored at the Site or at another location agreed to in writing; provided, each such individual item has a value of more than $5,000 and will become a permanent part of the WORK. The Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that the CONTRACTOR has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect the OWNER's interest therein, all of which will be satisfactory to the OWNER.

14.4 CONTRACTOR'S WARRANTY OF TITLE

A. The CONTRACTOR warrants and guarantees that title to all WORK, materials, and equipment covered by an Application for Payment, whether incorporated in the WORK or not, will pass to the OWNER no later than the time of payment, free and clear of all Liens.

14.5 REVIEW OF APPLICATIONS FOR PROGRESS PAYMENT

A. The ENGINEER will, within 7 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the application to the OWNER, or return the application to the CONTRACTOR indicating in writing the ENGINEER's reasons for refusing to recommend payment. In the latter case, the CONTRACTOR may make the necessary corrections and resubmit the application. If the ENGINEER still disagrees with a portion of the application, it will submit the application recommending the undisputed portion of the application to the OWNER for payment and provide reasons for recommending non-payment of the disputed amount. Thirty days

after presentation of the Application for Payment with the ENGINEER's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.5B.) become due and when due will be paid by the OWNER to the CONTRACTOR.

B. The ENGINEER, in its discretion, may refuse to recommend the whole or any part of any payment. ENGINEER may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:

1. The work is Defective Work or the completed WORK has been damaged requiring correction or replacement.
2. The Contract Price has been reduced by written amendment or Change Order.
3. The OWNER has been required to correct Defective Work or complete WORK in accordance with Paragraph 13.7.
4. ENGINEER has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.1 through 15.4 inclusive.

C. The OWNER may refuse to make payment of the full amount recommended by the ENGINEER because:

1. Claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the WORK.
2. Liens have been filed in connection with the WORK, except where CONTRACTOR has delivered a specific Bond satisfactory to OWNER to secure the satisfaction and discharge of such Liens.
3. There are other items entitling OWNER to a set-off against the amount recommended, or
4. OWNER has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.5B. through 14.5C and 15.1 through 15.4 inclusive. The OWNER must give the CONTRACTOR immediate written notice (with a copy to the ENGINEER) stating the reasons for such action and promptly pay the CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, when CONTRACTOR corrects to OWNER's satisfaction the reasons for such action.

14.6 SUBSTANTIAL COMPLETION

A. When the CONTRACTOR considers the WORK ready for its intended use, the CONTRACTOR shall notify the OWNER and the ENGINEER in writing that the WORK is substantially complete. The CONTRACTOR shall attach to this request a list of all work items that remain to be completed and a request that the ENGINEER prepare a Notice of Completion. Within a reasonable time thereafter, the OWNER, the CONTRACTOR, and the ENGINEER shall make an inspection of the WORK to determine the status of completion. If the ENGINEER does not consider the WORK substantially complete, or the list of remaining work items to be comprehensive, the ENGINEER will notify the CONTRACTOR in writing giving the reasons therefor. If the

ENGINEER considers the WORK substantially complete, the ENGINEER will prepare and deliver to the OWNER for its execution and recordation the Notice of Completion signed by the ENGINEER and CONTRACTOR, which shall fix the date of Substantial Completion.

14.7 PARTIAL UTILIZATION

A. The OWNER shall have the right to utilize or place into service any item of equipment or other usable portion of the WORK prior to completion of the WORK. Whenever the OWNER plans to exercise said right, the CONTRACTOR will be notified in writing by the OWNER, identifying the specific portion or portions of the WORK to be so utilized or otherwise placed into service.

B. It shall be understood by the CONTRACTOR that until such written notification is issued, all responsibility for care and maintenance of all of the WORK shall be borne by the CONTRACTOR. Upon issuance of said written notice of Partial Utilization, the OWNER will accept responsibility for the protection and maintenance of all such items or portions of the WORK described in the written notice.

C. The CONTRACTOR shall retain full responsibility for satisfactory completion of the WORK, regardless of whether a portion thereof has been partially utilized by the OWNER, and the CONTRACTOR's one year correction period shall commence only after the date of Substantial Completion for the WORK.

14.8 FINAL APPLICATION FOR PAYMENT

A. After the CONTRACTOR has completed all of the remaining work items referred to in Paragraph 14.6 and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, marked-up record documents (as provided in the General Requirements), and other documents, all as required by the Contract Documents, and after the ENGINEER has indicated that the WORK is acceptable, the CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents, together with complete and legally effective releases or waivers (satisfactory to the OWNER) of all Liens arising out of or filed in connection with the WORK.

14.9 FINAL PAYMENT AND ACCEPTANCE

A. If, on the basis of the ENGINEER's observation of the WORK during construction and final inspection, and the ENGINEER's review of the final Application for Payment and accompanying documentation, all as required by the Contract Documents, the ENGINEER is satisfied that the WORK has been completed and the CONTRACTOR's other obligations under the Contract Documents have been fulfilled, the ENGINEER will, within 14 days after receipt of the final Application for Payment, indicate in writing

the ENGINEER's recommendation of payment and present the application to the OWNER for payment.

B. After acceptance of the WORK by the OWNER's governing body, the OWNER will make final payment to the CONTRACTOR of the amount remaining after deducting all prior payments and all amounts to be kept or retained under the provisions of the Contract Documents, including the following items:

1. Liquidated damages, as applicable;
2. Amounts withheld by OWNER under Paragraph 14.5B. and C. which have not been released; and
3. Two times the value of outstanding items of correction work or punch list items yet uncompleted or uncorrected, as applicable. All such work shall be completed or corrected to the satisfaction of the OWNER within the time stated on the Notice of Completion, otherwise the CONTRACTOR does hereby waive any and all claims to all monies withheld by the OWNER to cover the value of all such uncompleted or uncorrected items.

C. As a condition of final payment, the CONTRACTOR shall be required to execute a release on the form provided by OWNER, releasing the OWNER from any and all claims of liability for payment on the Project except for such amounts as may be specifically described and excluded from the release.

14.10 RELEASE OF RETAINAGE AND OTHER DEDUCTIONS

A. After executing the necessary documents to initiate the Lien period, and not more than 45 days thereafter (based on a 30-day Lien filing period and 15-day processing time), the OWNER will release to the CONTRACTOR the retainage funds withheld pursuant to the Agreement, less any deductions to cover pending claims against the OWNER pursuant to Paragraph 14.5C.

B. After filing of the necessary documents to initiate the Lien period, the CONTRACTOR shall have 30 days to complete any outstanding items of correction work remaining to be completed or corrected as listed on a final punch list made a part of the Notice of Completion. Upon expiration of the 45 days, referred to in Paragraph 14.10A., the amounts withheld pursuant to the provisions of Paragraph 14.9B. herein, for all remaining work items will be returned to the CONTRACTOR; provided, that said work has been completed or corrected to the satisfaction of the OWNER within said 30 days. Otherwise, the CONTRACTOR does hereby waive any and all claims for all monies withheld by the OWNER under this Agreement to cover two times the value of such remaining uncompleted or uncorrected items.

ARTICLE 15 -- SUSPENSION OF WORK AND TERMINATION

15.1 SUSPENSION OF WORK BY OWNER

A. The OWNER may, at any time and without cause, suspend the WORK or any portion thereof for a period of not more than 90 days by notice in writing to the CONTRACTOR without claim by CONTRACTOR for additional compensation. Beyond the ninety (90) day period, the CONTRACTOR shall resume the WORK on receipt of a notice of resumption of work. The CONTRACTOR will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if the CONTRACTOR makes an approved claim therefore as provided in Articles 11 and 12.

15.2 TERMINATION OF AGREEMENT BY OWNER FOR DEFAULT

A. In the event of default by the CONTRACTOR, the OWNER may give seven days written notice to the CONTRACTOR of OWNER's intent to terminate the Agreement and provide the CONTRACTOR an opportunity to remedy the conditions constituting the default within a specified period of time. It will be considered a default by the CONTRACTOR whenever CONTRACTOR shall:

1. Declare bankruptcy, become insolvent, or assign its assets for the benefit of its creditors;
2. Disregard or violate the Laws or Regulations of any public body having jurisdiction;
3. Fail to provide materials or workmanship meeting the requirements of the Contract Documents;
4. Disregard or violate provisions of the Contract Documents or ENGINEER's instructions;
5. Fail to prosecute the WORK according to the approved progress schedule;
6. Fail to provide a qualified superintendent, competent workmen, or materials or equipment meeting the requirements of the Contract Documents; or
7. Disregard the authority of the ENGINEER.

B. If the CONTRACTOR fails to remedy the conditions constituting default within the time allowed, the OWNER may then issue the notice of termination.

C. In the event the Agreement is terminated in accordance with Paragraph 15.2A., herein, the OWNER may take possession of the WORK and may complete the WORK by whatever method or means the OWNER may select. The cost of completing the WORK will be deducted from the balance which would have been due the CONTRACTOR had the Agreement not been terminated and the WORK completed in accordance with the Contract Documents. If such cost exceeds the balance which would have been due, the CONTRACTOR shall pay the excess amount to the OWNER. If such cost is less than the balance which would have been due, the CONTRACTOR shall not have claim to the difference.

15.3 TERMINATION OF AGREEMENT BY OWNER FOR CONVENIENCE

A. Upon seven days' written notice to the CONTRACTOR and the ENGINEER, the OWNER may, without cause and without prejudice to any other right or remedy of the

OWNER, elect to terminate the Agreement. In such case, the CONTRACTOR shall be paid (without duplication of any items):

1. For completed and acceptable WORK executed in accordance with the Contract Documents, prior to the effective date of termination, including fair and reasonable sums for overhead and profit of such WORK;
2. For expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted WORK, plus fair and reasonable sums for overhead and profit on such expenses;
3. For all reasonable claims, costs, losses, and damages incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
4. For reasonable expenses directly attributable to termination, CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.4 TERMINATION OF AGREEMENT BY CONTRACTOR

A. The CONTRACTOR may terminate the Agreement upon 14 days written notice to the OWNER, whenever:

1. The WORK has been suspended under the provisions of Paragraph 15.1, herein, for more than 90 consecutive days through no fault or negligence of the CONTRACTOR, and notice to resume work or to terminate the Agreement has not been received from the OWNER within this time period; or
2. The OWNER should fail to pay the CONTRACTOR any monies due him in accordance with the terms of the Contract Documents and within 60 days after presentation to the OWNER by the CONTRACTOR of a request therefor, unless within said 14-day period the OWNER shall have remedied the condition upon which the payment delay was based.

B. In the event of such termination, the CONTRACTOR shall have no claims against the OWNER except for those claims specifically enumerated in Paragraph 15.3, herein, and as determined in accordance with the requirements of said paragraph.

ARTICLE 16 -- MISCELLANEOUS

16.1 GIVING NOTICE

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

16.2 TITLE TO MATERIALS FOUND ON THE WORK

A. The OWNER reserves the right to retain title to all soils, stone, sand, gravel, and other materials developed and obtained from excavations and other operations connected with the WORK. Unless otherwise specified in the Contract Documents, neither the CONTRACTOR nor any Subcontractor shall have any right, title, or interest in or to any such materials. The CONTRACTOR will be permitted to use in the WORK, without charge, any such materials which meet the requirements of the Contract Documents.

16.3 RIGHT TO AUDIT

A. If the CONTRACTOR submits a claim to the OWNER for additional compensation, the OWNER shall have the right, as a condition to considering the claim, and as a basis for evaluation of the claim, and until the claim has been settled, to audit the CONTRACTOR's books to the extent they are relevant. This right shall include the right to examine books, records, documents, and other evidence and accounting procedures and practices, sufficient to discover and verify all direct and indirect costs of whatever nature claimed to have been incurred or anticipated to be incurred and for which the claim has been submitted. The right to audit shall include the right to inspect the CONTRACTOR's plant, or such parts thereof, as may be or have been engaged in the performance of the WORK. The CONTRACTOR further agrees that the right to audit encompasses all subcontracts and is binding upon Subcontractors. The rights to examine and inspect herein provided for shall be exercisable through such representatives as the OWNER deems desirable during the CONTRACTOR's normal business hours at the office of the CONTRACTOR. The CONTRACTOR shall make available to the OWNER for auditing, all relevant accounting records and documents, and other financial data, and upon request, shall submit true copies of requested records to the OWNER.

16.4 SURVIVAL OF OBLIGATIONS

A. All representations, indemnifications, warranties, and guaranties made in, required by or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the WORK or termination or completion of the Agreement.

16.5 CONTROLLING LAW

A. This Agreement is to be governed by the law of the state in which the Project is located.

16.6 SEVERABILITY

A. If any term or provision of this Agreement is declared invalid or unenforceable by any court of lawful jurisdiction, the remaining terms and provisions of the Agreement shall not be affected thereby and shall remain in full force and effect.

16.7 WAIVER

A. The waiver by the OWNER of any breach or violation of any term, covenant or condition of this Agreement or of any provision, ordinance, or law shall not be deemed to be a waiver of any other term, covenant, condition, ordinance, or law or of any subsequent breach or violation of the same or of any other term, covenant, condition, ordinance, or law. The subsequent payment of any monies or fee by the OWNER which may become due hereunder shall not be deemed to be a waiver of any preceding breach or violation by CONTRACTOR or any term, covenant, condition of this Agreement or of any applicable law or ordinance.

- END OF GENERAL CONDITIONS -

SUPPLEMENTARY GENERAL CONDITIONS

PART 1-- GENERAL

These Supplementary General Conditions make additions, deletions, or revisions to the General Conditions as indicated herein. All provisions which are not so added, deleted, or revised remain in full force and effect. Terms used in these Supplementary General Conditions which are defined in the General Conditions have the meanings assigned to them in the General Conditions.

SGC-1 DEFINITIONS

Add the following definitions to Article 1:

ENGINEER - In accordance with its contract with the OWNER, the ENGINEER is further defined as the firm of SDI Engineering, LLC, 5602 E. Iowa Rd., Edinburg, Texas 78542.

OWNER -The OWNER is further defined as the Edinburg Economic Development Council, 415 W. University Drive, Edinburg, Texas, 78541.

SGC-2.2 COPIES OF DOCUMENTS

The OWNER shall furnish to the CONTRACTOR two copies of the Contract Documents which may include bound reduced drawings, if any, together with two sets of full-scale Drawings. Additional quantities of the Contract Documents will be furnished at reproduction cost plus mailing cost if copies are mailed.

SGC-2.4 STARTING THE WORK

Add the following as Paragraphs 2.4C and 2.4D of the General Conditions:

C. The CONTRACTOR shall notify the Texas Excavation Safety System (TESS), Phone No. 1-800-DIG-TESS, at least 48 hours in advance of the commencement of work at any site to allow the member utilities to examine the construction site and mark the location of the utilities' respective facilities.

D. The CONTRACTOR acknowledges that some (or all) of the utility companies with facilities shown on the drawings may not be members of TESS and, therefore, not automatically contacted by the above referenced telephone number. The CONTRACTOR shall be responsible for making itself aware of utility company facilities not reported by the USA System, and shall be liable for any and all damages stemming from repair or delay costs or any other expenses resulting from the unanticipated discovery of underground utilities. The CONTRACTOR shall be responsible for notifying all of the utilities at least 48 hours in advance of the commencement of work at any site to allow the utilities to examine the construction site and mark the location of the utilities'

respective facilities. The CONTRACTOR shall also be responsible for verifying that each utility has responsibly responded to such notification.

SGC-4.2 REPORTS OF PHYSICAL CONDITIONS

In the preparation of the Contract Documents, the ENGINEER has relied upon reports of explorations and tests of subsurface conditions at the site prepared by a Geotechnical Engineer engaged for this project. The Geotechnical Engineer prepared a report for this project. A copy of this report and drawings may be examined at the office of Engineer/Architect, during regular business hours if said reports and drawings are not bound herein. The CONTRACTOR may rely upon the accuracy of the technical data contained in the geotechnical report and drawings; however, the interpretation of such technical data, including any interpolation or extrapolation thereof, and opinions contained in the report and drawings are not to be relied on by the CONTRACTOR.

SGC-4.5 HAZARDOUS MATERIALS

No reports have been made available to the ENGINEER to indicate there will be discovery of Asbestos, PCB's, Petroleum, Hazardous Wastes, and/or Radioactive Materials at the Site. If the Contractor encounters existing material on sites owned or controlled by the Owner or in material sources that are suspected by visual observation or smell to contain hazardous materials, the Contractor shall immediately notify the Engineer and the Owner. The Owner will be responsible for the testing for and removal or disposition of hazardous materials on sites owned or controlled by the Owner. The Owner may suspend the work, wholly or in part during the testing, removal or disposition of hazardous materials on sites owned or controlled by the Owner. Materials utilized in the project shall be free of any hazardous materials, except as may be specifically provided for in the specifications.

SGC-5.1 BONDS

Delete the first sentence of Paragraph 5.1A and add the following:

The CONTRACTOR shall furnish a satisfactory Performance Bond in the amount of 100 percent of the Contract Price and a satisfactory Payment Bond in the amount of 100 percent of the Contract Price as security for the faithful performance and payment of all the CONTRACTOR's obligations under the Contract Documents.

Add the following as Paragraph 5.1.D of the General Conditions (and renumber GC 5.1.D as 5.1.E):

5.1.D MAINTENANCE AND GUARANTY BOND

The CONTRACTOR shall provide a Maintenance and Guaranty Bond in the amount of 100 percent of the contract price to provide a guarantee against defects in the WORK occurring during the year following the one-year correction period. The Bond shall meet all of the

requirements listed in Paragraph 5.1 BONDS, shall be payable to the OWNER, and be at the sole cost of the CONTRACTOR.

SGC-5.2 INSURANCE

A. The limits of liability for the insurance required by Paragraph 5.2 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations. Limits may be provided by a combination of primary and excess liability policies or through a single policy. If the limits are provided by a combination of primary and excess liability policies, then the excess or umbrella liability overages shall include commercial general, comprehensive automobile and employer's liability and shall provide coverage at least as broad as the underlying policies.

1. Workers' Compensation:
   a. State: In accordance with State Statute
   b. Applicable Federal (e.g. USL&H): Statutory
   Note: If the WORK called for in the Contract Documents involves work in or on any navigable waters, the CONTRACTOR shall provide Workers' Compensation coverage which shall include coverage under the Longshore and Harbor Workers' Compensation Act, the Jones Act, Maritime Law, and any other coverage required under Federal or State laws pertaining to workers in or on navigable waters.

2. Comprehensive or Commercial General Liability:
   Combined Single Limit:

   a. Bodily Injury — $250,000 each person
      $500,000 each occurrence

   b. Property Damage — $100,000 each occurrence
      $100,000 aggregate

   -or- $500,000 combined single limits

3. Comprehensive Automobile Liability (including owned, hired, and non-owned vehicles): Combined Single Limit:

   a. Bodily Injury — $100,000 each person
      $500,000 each occurrence

   b. Property Damage — $100,000 each occurrence
      $100,000 each aggregate

   -or- $500,000 combined single limits

4. Protective Liability:

a.	Bodily Injury	$250,000 each person $500,000 each occurrence
b.	Property Damage	$100,000 each occurrence $100,000 each aggregate
	-or-	$500,000 combined single limits

B. All policies shall provide that the CONTRACTOR agrees to waive all rights of subrogation against the OWNER, the ENGINEER, and their subconsultants, employees, officers and directors, for WORK performed under the Agreement. Endorsements shall be provided with certificates of insurance.

C. All policies shall also specify that the insurance provided by the CONTRACTOR will be considered primary and not contributory to any other insurance available to the OWNER or ENGINEER.

D. All policies except Workers' Compensation and Builders Risk shall name the OWNER, ENGINEER, their consultants, subconsultants, and their officers, directors, agents and employees as additional insureds. The Builders Risk insurance shall name the CONTRACTOR, OWNER, and ENGINEER as named insureds.

E. All policies shall provide for thirty days notice prior to any cancellation, reduction in coverage or nonrenewal.

SGC-5.2C INSURANCE

Add the following to Paragraph 5.2C of the General Conditions:

The CONTRACTOR shall also name the OWNER and its officers, directors, agents, and employees as "additional insureds" under the insurance policies.

SGC-6.5 SUBSTITUTES OR "OR EQUAL" ITEMS

Add the following to Paragraph 6.5 of the General Conditions:

A. Whenever materials or equipment are indicated in the Contract Documents by using the name of a proprietary item or the name of a particular manufacturer, the naming of the item is intended to establish the type, function, and quality required. If the name is followed by the words "or equal" indicating that a substitution is permitted, materials or equipment of other manufacturers may be accepted if sufficient information is submitted by the CONTRACTOR to allow the ENGINEER to determine that the material or equipment proposed is equivalent or equal to that named, subject to the following requirements:

1. The burden of proof as to the type, function, and quality of any such substitution product, material or equipment shall be upon the CONTRACTOR.
2. The ENGINEER will be the sole judge as to the type, function, and quality of any such substitution and the ENGINEER's decision shall be final.
3. The ENGINEER may require the CONTRACTOR to furnish additional data about the proposed substitution.
4. The OWNER may require the CONTRACTOR to furnish a special performance guarantee or other surety with respect to any substitution.
5. Acceptance by the ENGINEER of a substitution item proposed by the CONTRACTOR shall not relieve the CONTRACTOR of the responsibility for full compliance with the Contract Documents and for adequacy of the substitution.
6. The CONTRACTOR shall pay all costs of implementing accepted substitutions, including redesign and changes to WORK necessary to accommodate the substitution.

B. The procedure for review by the ENGINEER will include the following:

1. If the CONTRACTOR wishes to provide a substitution item, the CONTRACTOR shall make written application to the ENGINEER on the "Substitution Request Form."
2. Unless otherwise provided by law or authorized in writing by the ENGINEER, the "Substitution Request Form(s)" shall be submitted within the 35-day period after award of the Contract.
3. Wherever a proposed substitution item has not been submitted within said 35-day period, or wherever the submission of a proposed substitution material or equipment has been judged to be unacceptable by the ENGINEER, the CONTRACTOR shall provide the material or equipment indicated in the Contract Documents.
4. The CONTRACTOR shall certify by signing the form that the list of paragraphs on the form are correct for the proposed substitution.
5. The ENGINEER will evaluate each proposed substitution within a reasonable period of time.
6. As applicable, no shop drawing submittals shall be made for a substitution item nor shall any substitution item be ordered, installed, or utilized without the ENGINEER'S prior written acceptance of the CONTRACTOR'S "Substitution Request Form."
7. The ENGINEER will record the time required by the ENGINEER in evaluating substitutions proposed by the CONTRACTOR and in making changes by the CONTRACTOR in the Contract Documents occasioned thereby.

C. The CONTRACTOR's application shall address the following factors which will be considered by the ENGINEER in evaluating the proposed substitution:

1. Whether the evaluation and acceptance of the proposed substitution will prejudice the CONTRACTOR's achievement of Substantial Completion on time.
2. Whether acceptance of the substitution for use in the WORK will require a change in any of the Contract Documents to adapt the design to the proposed substitution.

3. Whether incorporation or use of the substitution in connection with the WORK is subject to payment of any license fee or royalty.
4. Whether all variations of the proposed substitution from the items originally specified are identified.
5. Whether available maintenance, repair, and replacement service are indicated. The manufacturer shall have a local service agency (within 50 miles of the site) which maintains properly trained personnel and adequate spare parts and is able to respond and complete repairs within 24 hours.
6. Whether an itemized estimate is included of all costs that will result directly or indirectly from acceptance of such substitution, including cost of redesign and claims of other contractors affected by the resulting change.
7. Whether the proposed substitute item meets or exceeds the experience and/or equivalency requirements listed in the appropriate technical specifications.

D. Without any increase in cost to the OWNER, the CONTRACTOR shall be responsible for and pay all costs in connection with proposed substitutions and of inspections and testing of equipment or materials submitted for review prior to the CONTRACTOR's purchase thereof for incorporation in the WORK, whether or not the ENGINEER accepts the proposed substitution or proposed equipment or material. The CONTRACTOR shall reimburse the OWNER for the charges of the ENGINEER for evaluating each proposed substitution.

SGC-6.6 SUBCONTRACT LIMITATIONS

Add the following as Paragraph 6.6B of the General Conditions:

B. The CONTRACTOR shall perform not less than 20 percent of the WORK with its own forces (i.e., without subcontracting). The 20 percent requirement shall apply to the Contract Price less the values of OWNER-assigned contracts and allowances in the Bid for prenegotiated WORK.

SGC-6.7 PERMITS

A. Except for the permits specifically set forth in A above, the CONTRACTOR shall acquire all permits required by Laws or Regulations, including, without limitation, the following specific permits (if applicable):

1. Local jurisdiction building permits. OWNER will pay for local jurisdiction building permit. CONTRACTOR will be responsible for acquiring permit.
2. State permits to construct and/or operate sources of air pollution.
3. Certificates and permits are required for sources such as, but not limited to:
   a. Fuel burning equipment
   b. Gasoline and petroleum distillate storage containers
   c. Land disturbing activities
   d. Processing equipment (sand, gravel, concrete batch plant, etc.)
   e. Odors

4. Permits to construct and/or operating permits for construction should be obtained from: United Irrigation District
5. Stormwater Permit.
6. Permit-Required Confined Space - The workplace in which the WORK is to be performed may contain permit-required confined spaces (permit spaces) as defined 29 CFR 1910.146 and, if so, permit space entry is allowed only through compliance with a confined space entry program meeting the requirements of 29 CFR 1910.146.

SGC-6.17 INDEMNIFICATION

Add the following to Paragraph 6.17A of the General Conditions:

The CONTRACTOR shall also indemnify, defend, and hold harmless the OWNER, and its officers, directors, agents, and employees, against and from all claims and liability arising under or by reason of the Agreement or any performance of the WORK, but not from the sole negligence or willful misconduct of the OWNER.

SGC-9.3 PROJECT REPRESENTATION

A. The Owner, authorized representatives and agents of the Owner shall, at all times have access to and be permitted to observe and review all work, materials, equipment, payrolls, personnel records, employment conditions, material invoices, and other relevant data and records pertaining to this Contract. The Resident Project Representative, who is the OWNER's agent, will act as directed by and under the supervision of the OWNER and will confer with the ENGINEER regarding its actions. The Resident Project Representative's dealings in matters pertaining to the WORK shall, in general, be only with the ENGINEER and the CONTRACTOR, and dealings with Subcontractors shall only be through or with the full knowledge of the CONTRACTOR. Written communication with the OWNER will be only through or as directed by the ENGINEER.

B. The Resident Project Representative shall have the duties and responsibilities set forth in this paragraph.

1. Review the progress schedule of Shop Drawing submittals and schedule of values prepared by the CONTRACTOR and consult with the ENGINEER concerning their acceptability.
2. Attend preconstruction conferences. Arrange a schedule of progress meetings and other job conferences as required in consultation with the ENGINEER and notify in advance those expected to attend. Attend meetings and maintain and circulate copies of minutes thereof.
3. Serve as the ENGINEER's liaison with the CONTRACTOR, working principally through the CONTRACTOR's superintendent and assist said superintendent in understanding the intent of the Contract Documents. Assist the ENGINEER in serving as the OWNER's liaison with the CONTRACTOR.
4. Receive Shop Drawings and samples furnished by the CONTRACTOR.

5. Conduct on-site observations of the WORK in progress to assist the ENGINEER in determining if the WORK is proceeding in accordance with the Contract Documents.
6. Verify that the tests, equipment, and systems startups and operating and maintenance instruction are conducted as required by the Contract documents and in presence of the required personnel, and that the CONTRACTOR maintains adequate records thereof.
7. Transmit to the CONTRACTOR the ENGINEER's clarifications and interpretations of the Contract Documents.
8. Consider and evaluate the CONTRACTOR's suggestions for modifications in the Contract Documents and report them with recommendations to the ENGINEER.
9. Review applications for payment with the CONTRACTOR for compliance with the established procedure for their submittal and forward them with recommendations to the ENGINEER, noting particularly their relation to the schedule of values, work completed, and materials and equipment delivered at the Site but not incorporated in the WORK.
10. During the course of the WORK, verify that certificates, maintenance and operation manuals, and other data required to be assembled and furnished by the CONTRACTOR are applicable to the items actually installed.
11. Before the ENGINEER prepares a Notice of Completion, as applicable, submit to the CONTRACTOR a list of observed items requiring completion or correction.
12. Conduct final inspection in the company of the ENGINEER, the OWNER, and the CONTRACTOR, and prepare a punch list of items to be completed or corrected.
13. Verify that all items on the punch list have been completed or corrected and make recommendations to the ENGINEER concerning acceptance.

SGC-11.3D EQUIPMENT

The CONTRACTOR will be paid for the use of equipment at the rental rate listed for such equipment specified in the current edition of the following reference publication:

A. "Rental Rate Blue Book for Construction Machinery" as published by the Machinery Information Division of the K-III Directory Corporation, (800) 669-3282.

SGC-12.2 WEATHER DELAYS

Delete paragraphs 12.2.A and 12.2.B. Add the following:

A. The occurrence of unusually severe weather during the life of the Contract will be considered a basis for extending contract time when work is not already suspended for other reasons. Unusually severe weather means weather, which at the time of year that it occurs, is unusual for the place in which it occurs.

B. Extension of time for unusually severe weather will be determined on a monthly basis and will include only those actual adverse weather days in excess of the normal adverse weather days included in the Contract Time. Normal adverse weather means adverse weather which, regardless of its severity, is to be reasonable expected for that particular

place at that particular time of year. The normal adverse weather days included in the Contract Time are based on historical records of temperature and precipitation.

C. Actual adverse weather days are those days meeting one or more of the criteria listed below. Time extensions for more than one criterion will take into consideration only that criterion having the greatest impact. Those actual adverse weather days in excess of the days listed in Table 12-1 will be allowed without regard to when they occur (except prior to mobilization or during suspension for other reasons) or their impact on contract completion.

1. Days with maximum temperature of 32 degrees F or less – one full day allowed.
2. Days with minimum temperature of 32 degrees F or less, but whose maximum temperature is over 32 degrees F – one-half day allowed.
3. Days when ½" or more of precipitation (rain or snow equivalent) occurs – one full day allowed.

D. Attached to the monthly Extension of Time Request, the CONTRACTOR shall submit a summary statement showing the number of days charged to the Contract for the preceding period

1. An itemized account of each day of the month showing which days meet one of the criteria outlined above.
3. A total number of adverse weather days.
4. The total number of days due to the CONTRACTOR for adverse weather days in excess of the normal adverse weather days.

SGC-14.3C AMOUNT OF RETENTION

Add the following to Paragraph 14.3C of the General Conditions:

Unless otherwise prescribed by law, the OWNER may retain a portion of the amount otherwise due to the CONTRACTOR, as follows:

1. Contracts equaling a total amount of $400,000.00 or over will bear a retainage of five (5) percent (%) on each partial disbursement. Contracts totaling less than $400,000.00 will bear a retainage of ten (10) percent (%) on each partial disbursement.

SGC-14.3D VALUE OF MATERIALS STORED AT THE SITE

Unless otherwise prescribed by law, the value of materials stored at the Site shall be 90% of the value of such materials.

SGC-16.8 OPERATION AND MAINTENANCE MANUALS AND TRAINING.

A. The Contractor shall obtain installation, operation, and maintenance manuals from manufacturers and suppliers for equipment furnished under the contract. The Contractor shall submit three copies of each complete manual to the Engineer within 90 days after approval of shop drawings, product data, and samples, and not later than the date of shipment of each item of equipment to the project site or storage location.

B. Each manual is to be bound in a folder and labeled to identify the contents and project to which it applies. The manual shall contain the following applicable items:

1. A listing of the manufacturer's identification, including order number, model, serial number, and location of parts and service centers.
2. A list of recommended stock of parts, including part number and quantity.
3. Complete replacement parts list.
4. Performance data and rating tables.
5. Specific instructions for installation, operation, adjustment, and maintenance.
6. Exploded view drawings for major equipment items.
7. Lubrication requirements.
8. Complete equipment wiring diagrams and control schematics with terminal identification.

C. Operations and maintenance manuals specified herein are in addition to any operation, maintenance, or installation instructions required by the Contractor to install, test, and start-up the equipment.

D. The Owner shall require the Engineer to promptly review each manual submitted, noting necessary corrections and revisions. If the Engineer rejects the manual, the Contractor shall correct and resubmit the manual until it is acceptable to Engineer as being in conformance with design concept of project and for compliance with information given in the Contract Documents. Owner may assess Contractor a charge for reviews of same items in excess of three (3) times. Such procedure shall not be considered cause for delay. Acceptance of manuals by Engineer does not relieve Contractor of any requirements or terms of the Contract.

E. The Contractor shall provide the services of trained, qualified technicians to check final equipment installation, to assist as required in placing same in operation, and to instruct operating personnel in the proper manner of performing routine operation and maintenance of the equipment.

SGC-16.9 AS-BUILT DIMENSION & DRAWINGS.

A. Contractor shall make appropriate daily measurements of facilities constructed and keep accurate records of location (horizontal and vertical) of all facilities.

B. Upon completion of each facility, the Contractor shall furnish Owner with one set of direct prints, marked with red pencil, to show as-built dimensions and locations of all work constructed. As a minimum, the final drawings shall include the following:

1. Horizontal and vertical locations of work.
2. Changes in equipment and dimensions due to substitutions.
3. "Nameplate" data on all installed equipment.
4. Deletions, additions, and changes to scope of work.
5. Any other changes made.

END OF SUPPLEMENTARY GENERAL CONDITIONS

EEDC NORTH PARK

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SECTION 012300 – ALTERNATES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
   1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
   2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
   1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of the alternate.

B. Execute accepted alternates under the same conditions as other work of the Contract.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Proposed alternates are listed on the Bid Proposal Form. The intent of each item is to have a complete working item. Include all miscellaneous items, accessories, objects and all incidentals to be required for a complete working installation whether or not indicated as part of the alternate. It is the Contractor's responsibility to request clarification if alternate items are unclear prior to bidding.

END SECTION

SECTION 013100 – PROJECT MANAGEMENT AND COORDINATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project.

B. Each contractor shall participate in coordination requirements.

1.3 DEFINITIONS

A. RFI: Request for Information. Request form Owner, Architect/Engineer, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and scheduled activities of other contractors to avoid conflicts and to ensure

orderly progress of Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of Schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Training of Owner's personnel.

1.5 REQUESTS FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
   1. Architect/Engineer will return without response those RFI's submitted to Architect/Engineer by other entities controlled by Contractor.
   2. Coordinate and submit RFI's in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
   1. Project name.
   2. Project number.
   3. Date.
   4. Name of Contractor.
   5. Name of Architect/Engineer.
   6. RFI Number, numbered sequentially.
   7. RFI Subject.
   8. Specification Section number and title related to paragraphs, as appropriate.
   9. Drawing number and detail references, as appropriate.
   10. Field dimensions and conditions, as appropriate.
   11. Contractor's suggested resolution. If Contractor suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state the impact in the RFI including a breakdown of cost for each item.
   12. Contractor's signature.
   13. Attachments: Including sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716 or Software generated form with substantially the same content as indicated above, acceptable to Architect/Engineer.
   1. Attachments shall be electronic files in PDF format.

D. Architect's/Engineer's Action: Architect/Engineer will review each RFI, determine action required, and respond. Allow seven working days for Architect's/Engineer's response for each RFI. RFI's received by Architect/Engineer after 2 p.m. will be considered as received the following working day.
   1. The following Contractor-generated RFI's will be returned without action:
      a. Request for approval of submittals.
      b. Request for approval of substitutions.
      c. Requests for approval of Contractor's means and methods.
      d. Request for coordination information already indicated in the Contract Documents.
      e. Request for adjustment in the Contract Time or the Contract Sum.
      f. Request for interpretation of Architect's/Engineer's actions on submittals.
      g. Incomplete RFI's or inaccurately prepared RFI's.

   2. Architect's/Engineer's action may include a request for additional information, in which case Architect's/Engineer's time for response will date from time of receipt by Architect/Engineer of additional information.
   3. Architect's/Engineer's action on RFI's that may result in a charge to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal.
      1. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect/Engineer in writing within 10 days of receipt of the RFI response.

E. RFI Log: Contractor shall prepare and maintain a tabular log of RFI's.

1.5 PROJECT MEETINGS

A. General: From time to time and as required, project meetings will be called and coordinated by the Architect/Engineer unless otherwise indicated.

1. Agenda: Review progress of other construction activities and preparations for activities under consideration, including:
   a. Contract Documents.
   b. Options.
   c. Related RFI's
   d. Related Change Orders.
   e. Change Directives.
   f. Purchases.
   g. Deliveries.
   h. Submittals.
   i. Review for mockups.
   j. Possible conflict.
   k. Compatibility requirements.
   l. Time schedule.
   m. Weather limitations.
   n. Manufacturer's written instructions.
   o. Warranty requirements.
   p. Compatibility of materials.
   q. Temporary facilities and controls.
   r. Space access limitations.
   s. Regulations of authorities having jurisdiction.
   t. Testing and inspecting requirements.
   u. Coordination of work.
   v. Required performance results.
   w. Protecting adjacent work.
   x. Protection of construction and personnel.

B. Preconstruction Conference: Architect/Engineer will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect/Engineer.
   1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, Engineer and their consultants; Contractor and its superintendent; major subcontractors; suppliers, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Discuss items of significance that would affect progress, including the following:
      a. Responsibility and personnel assignments.
      b. Tentative construction schedule.
      c. Phasing.
      d. Critical work sequencing and long lead items.
      e. Designation of key personnel and their duties.
      f. Lines of communications.

g. Use of web-based Project software.
h. Procedures for processing field decisions and Change Orders.
i. Procedures for RFI's.
j. Procedures for testing and inspecting.
k. Procedures for processing Applications for Payment.
l. Distribution of Contract Documents.
m. Submittal Procedures.
n. Use of premises.
o. Work restrictions.
p. Working hours.
q. Owner's occupancy requirements.
r. Responsibility for temporary facilities and control.
s. Procedures for disruptions and shutdowns.
t. Construction waste management and recycling.
u. Parking availability.
v. Office, work, and storage areas.
w. Equipment deliveries and priorities.
x. Security.

C. Pre-installation Conference: Architect/Engineer may conduct a pre-installation conference at Project site prior to major construction activities.

D. Project Closeout Conference: Architect/Engineer may conduct a project closeout conference, at a time convenient to the Owner and Architect/Engineer, prior to the date of Substantial Completion.
   1. Conference shall review requirements and responsibilities related to project closeout and discuss items of significance that could affect or delay Project closeout, including the following:
      a. Preparation of Record Documents.
      b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
      c. Submittal of written warranties.
      d. Requirements for preparing operations and maintenance data.
      e. Requirements for delivery of material samples, and spare parts.
      f. Requirements for demonstration of training.
      g. Preparation of Contractor's punch list.
      h. Procedures for processing Application for Payment at Substantial Completion for final payment.
      i. Submittal procedures.
      j. Owner's partial occupancy requirements.
      k. Responsibility for removing temporary facilities and controls.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END SECTION

SECTION 013200 – CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Startup construction schedule.
   2. Contractor's Construction Schedule.
   3. Construction schedule updating reports.
   4. Daily construction reports
   5. Site condition reports
   6. Unusual event reports.

B. Related Requirements:
   1. Section 01 29 00 "Payment Procedures" for submitting Contractor's Construction Schedule with initial and progress applications for payment.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
   1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of the Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.
   1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet scheduled milestones and Contract completion date.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
   3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
   1. Working electronic copy of schedule file, where indicated.
   2. PDF file.
   3. Two paper copies, of sufficient size to display entire period or schedule, as required.

B. Startup construction schedule.
   1. Submittal of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
   1. Submit a working digital copy of schedule, and labeled to comply with requirements for submittals.

E. Daily construction Reports: Submit at weekly intervals.

F. Construction Schedule Updates: Submit with Application for Payment.

G. Unusual Event Reports: Submit at time of unusual event.

1.5 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction.

1.6 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project Site:
   1. List of subcontractors at Project site.
   2. List of separate contractors at Project site.
   3. Approximate count of personnel at Project site.
   4. Equipment at Project site.
   5. Material deliveries.
   6. High and low temperatures and general weather conditions, including presence of rain.
   7. Testing and inspection.
   8. Accidents.
   9. Meetings and significant decisions.
   10. Unusual events.
   11. Stoppage delays shortages and losses.
   12. Meter readings and similar recordings.
   13. Emergency procedures
   14. Order and requests of authorities having jurisdiction.
   15. Change Orders received and implemented.
   16. Construction Change Directives received and implemented.
   17. Services connected and disconnected.
   18. Equipment or system tests and startups.
   19. Partial completions and occupancies.
   20. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and Contract Documents, prepare and submit a

detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for any changes.

C. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, and responses by Contractor's personnel, evaluation of result or effects, and similar pertinent information. Advise Owner in advance when these events are known and predictable.
   1. Submit unusual event reports directly to Architect/Engineer within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END SECTION

SECTION 013233 – PHOTOGRAPHIC DOCUMENTATION

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Preconstruction photographs.
   2. Periodic construction photographs.
   3. Final completion construction photographs.

1.2 INFORMATIONAL SUBMITTALS

A. Provide photos of site prior to beginning of construction. Mark notation and vantage points and direction on each photograph, date and time photograph was taken, and number photographs in sequential order. Provide enough photos to give a clear indication of site conditions, trees, and any architectural elements.
   1. Photographs should be clear and without defects.

B. Provide photographs in JPG format, produced by a digital camera with minimum sensor of 12 megapixels. Use flash in low light levels or backlit conditions.

C. Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

D. Metadata: Record accurate date and time and GPS location data from camera.

E. File Names: Name media files with date, project area and sequential numbering suffix.

F. Provide data on thumb drive, CD, or DropBox account established with the Architect/Engineer. DropBox files are the preferred means of transfer of documents with the Architect/Engineer. If DropBox is used, advise Architect/Engineer of submission of documents when uploaded.

1.5 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Should be qualified to take construction photographs.

B. General: Take photographs with maximum depth of field and in focus.

C. Preconstruction Photographs: Before commencement of excavation, commencement of demolition, or starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect/Engineer.
   1. Flag construction limits before taking construction photographs.
   2. Take a minimum of 20 photographs showing existing conditions adjacent to property before starting the Work.
   3. Take a minimum of 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
   4. Take additional photographs as required to record settlement, cracking, or any additional damage to adjacent structures, pavements, and improvements.

D. Periodic Construction Photographs: Take a minimum of 25 photographs weekly. Select vantage points to show status of construction and progress since last photographs were taken.

E. Final Completion Construction Photographs: Take a minimum of 50 photographs after date of Substantial Completion for submission as Project Record Documents. Architect/Engineer will inform photographer of desired vantage points.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END SECTION

SECTION 015626 – TEMPORARY FENCING

PART 1 - GENERAL

1.1 PROTECTIVE BARRIERS AND SIGNAGE

A. No public access shall be allowed on the site of work until the construction is completed and accepted by the Owner. Enclose the site and maintain protective fencing and barriers during demolition and construction operations to prevent public access. Provide all specified and necessary signage to inform and restrict public access.

B. Protective barriers to restrict access to the construction site shall be temporary, portable chain-link fencing: minimum 2-inch, 0.148 inch-thick, galvanized steel, chain-link fabric fencing: minimum 6 feet tall with galvanized steel pipe posts; minimum 2-3/8 inch OD line posts and 2-7/8 inch OD corner and pull posts, with 1-5/8 inch OD top and bottom rails, with galvanized steel bases for supporting posts. Provide access as required for the construction operations. Secure all fencing at the end of each work day and monitor at busy times of day, i.e. the start, end, and lunch times of the school day. Install fence before construction operations begin.

1.2 DAMAGE TO PROPERTY

A. Without expense to the Owner, restore to its original condition any adjacent property that has been damaged due to the negligence and/or work of the Contractor's agents, employees or subcontractors. Complete all such repairs to the satisfaction of the Engineer.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 017300 – EXECUTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing execution of the work including, but not limited to, the following:
   1. Construction layout
   2. Field engineering ad surveying
   3. Installation of the work
   4. Cutting and patching
   5. Coordination of Owner-installed products
   6. Progress cleaning
   7. Starting and adjusting
   8. Protection of installed construction

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation of performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 PRE-INSTALLATION MEETINGS

A. Cutting and Patching Conference: Conduct conference at Project site.
   1. Prior to submitting cutting and patching plan, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
      a. Contractor's Superintendent
      b. Trade Supervisor responsible for cutting operations
      c. Trade Supervisor(s) responsible for patching of each type of

substrate

d. Mechanical, electrical, and utilities subcontractors' supervisor, to the extent each trade is affecting by cutting and patching operations.

2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Cutting and Patching Plan: Submit plan describing procedures at least ten (10) days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities, Mechanical, and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
   a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.6 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect/Engineer of locations and details of cutting and await directions before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    a. Primary Operational Systems and Equipment
    b. Fire Separation Assemblies
    c. Air or Smoke barriers
    d. Fire-Suppression Systems
    e. Plumbing Piping Systems
    f. Mechanical Systems Piping and Ducts
    g. Control Systems
    h. Communication Systems
    i. Fire-Detection and Alarm Systems
    j. Conveying Systems
    k. Electrical Wiring Systems
    l. Operating Systems of Special Construction

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safely. Other construction elements include but are not limited to the following:
    a. Water, moisture, or vapor barriers
    b. Membranes and flashings
    c. Exterior curtain-wall construction
    d. Sprayed fire-resistive material
    e. Equipment supports
    f. Piping, ductwork, vessels, and equipment
    g. Noise and vibration control elements and systems
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's/Engineer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacture's written recommendations and instructions for installation of products and equipment.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.
   1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. Fore exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect/Engineer for the visual and functional performance of in-place materials.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the work.
   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
   1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the work properly. Recheck measurements before installing each product. Where portions of the work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect/Engineer according to requirements in Section 01 31 00 “Project Management and Coordination”.

3.3 CONSTRICTION LAYOUT

A. Verification: Before proceeding to lay out the work, verify layout information shown on drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect/Engineer promptly.

B. General: Engage a registered land surveyor or Professional Engineer to lay out the work using accepted surveying practices.
1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of project.

2. Establish limits on use of project site.
3. Establish dimensions within tolerances indicated. Do not scale drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the work progresses.
6. Notify Architect/Engineer when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect/Engineer.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect/Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect/Engineer before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
   1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
   2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the work.
   3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.

E. Final Property Survey: Engage a registered land surveyor or professional engineer to prepare a final property survey showing significant features (real property) for project. Include on the survey a certification, signed by registered land surveyor or professional engineer, that principal metes, bounds, lines, and levels of project are accurately positioned as shown on the survey.
   1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
   2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey".

3.5 INSTALLATION

A. General: Locate the work and components of the work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
   4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect/Engineer.
   2. Allow for building movement, including thermal expansion and contraction.
   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Repair or remove and replace damaged, defective, or nonconforming work.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements.

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize or prevent interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the work with work performed by Owner's construction personnel.
   1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
   2. Pre-installation Conferences: Include Owner's construction personnel at pre-installation conferences covering portions of the work that are to receive Owner's work. Attend pre-installation conferences conducted by Owner's construction personnel if portions of the work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold waste materials more than seven days during normal weather or three (3) days if the temperature is expected to rise above 80 deg F.
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
      a. Use containers intended for holding waste materials of type to be stored.
   4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on site. Do not wash waste materials down sewers or into waterways. Must comply with waste disposal requirements.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction completed or in progress is, subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

END OF SECTION

SECTION 017823 – OPERATION MAINTENANCE DATA

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operations and maintenance documentation directory manuals.
   2. Emergency manuals.
   3. System and equipment operation manuals.
   4. System and equipment maintenance manuals.
   5. Product maintenance manuals.

1.3 DEFINITIONS

A. System: an organized collection of parts, equipment or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Architect/Engineer and Commissioning Authority will comment on whether content of operation and maintenance submittals is acceptable.
   2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:
   1. Submit on digital media acceptable to Architect/Engineer.
   2. Submit three (3) paper copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect/Engineer and Commissioning Authority will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in fine form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
   1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

E. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
   1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
   2. File Names and Bookmarks: Bookmark individual documents based on file names. Name documents files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, sot that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
   1. Binder: Heavy duty, three-ring, vinyl covered, loose leaf binders, in thickness necessary to accommodate contents, sized to hold 8 ½ by 11

inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside to hold folder oversized sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
4. Supplementary Text: Prepared on 8 ½ by 11 inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   a. If oversized drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indication drawing titles, descriptions of contents, and drawing locations.

1.6 REQUIREMENTS FOR EMERGENCY OPERATIONS, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system or subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.
   2. Table of contents.
   3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Engineer.
9. Name and contact information for Commissioning Authority.
10. Names and contact information for major consultants to the Architect/Engineer that designed the systems contained in the manuals.
11. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-reference to Specification Section number in Project Manual.
   1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exits, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
   1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
3. Table of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 SYSTEM AND EQUIPMENT OPERATIONS MANUAL

A. System and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
   1. Engage a factory authorized service representative to assemble and prepare information for each system, and piece of equipment not part of the system.
   2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements of this Section, include operation data required in individual Specification Sections and the following information.
   1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
   2. Performance and design criteria if Contractor has delegated design responsibility.
   3. Operating standards.
   4. Operating procedures.
   5. Operating logs.
   6. Wiring diagrams.
   7. Control diagrams.
   8. Piped system diagrams.
   9. Precautions against improper use.
   10. License requirements including inspection and renewal dates.

C. Description: Include the following:
   1. Product name and model number. Use designations for products indicated on Contract Documents.
   2. Manufacturer's name.
   3. Equipment identification with serial number of each component.
   4. Equipment function.
   5. Operating characteristics.
   6. Limiting conditions.

7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedure: Include the following, as applicable:
1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routing and normal operating instruction.
4. Regulation and control procedures.
5. Instruction on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electrical or electronic systems.
9. Special operating instruction and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.09 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and system diagrams, lists of spare parts, and warranty information.
1. Engage a factory authorized service representative to assemble and prepare information for each system, and piece of equipment not part of the system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedule, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match

manual's table of contents. For each product list names, address, and telephone number of installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment.
   1. Standard maintenance instruction and bulletins: include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the work. If data includes more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
      a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
   2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
   3. Identification and nomenclature of parts and components.
   4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
   1. Test and inspection instructions.
   2. Troubleshooting guide.
   3. Precautions against improper maintenance.
   4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   5. Aligning, adjusting, and checking instructions.
   6. Demonstration and training video recording if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
   1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
   2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross reference to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record drawings to ensure correct illustration of complete installation.
   1. Do not use original project record documents as part of maintenance manuals.

1.10 PRODUCE MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual identified by product name and arranged to match manual's table of contents. For each product, list names, address, and telephone number of installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:
   1. Product name and model number.
   2. Manufacturers' name.
   3. Color, pattern, and texture.

4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturers' written recommendations and the following:
   1. Inspection procedures.
   2. Types of cleaning agents to be used and methods of cleaning.
   3. List of cleaning agents and methods of cleaning detrimental to product.
   4. Schedule for routine cleaning and maintenance.
   5. Repair instructions.

F. Repair Materials and Sources: Include list of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notification for warranty claims.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END SECTION

SECTION 017839 – PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.
   4. Miscellaneous record submittals.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit one set(s) of marked up record prints.
   2. Number of Copies: Submit copies of record Drawings ad follows:
      a. Initial Submittal:
         1) Submit one paper copy set of marked up record prints.
         2) Submit PDF electronic files of scanned record prints and one of file prints.
         3) Submit record digital data files and one set of plots.
         4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
      b. Final Submittal:
         1) Submit one paper copy set(s) of marked up record prints.
         2) Submit PDF electronic files of scanned record prints and three sets prints.
         3) Print each drawing, whether or not changes and additional information were recorded.
      c. Final Submittal:
         1) Submit one paper copy set of marked up record prints.
         2) Submit record digital data files and three sets of record digital data file plots.

3) Plot each drawing file, whether or not changes and additional information where recorded.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy and annotated PDF electronic files and directories of each submittal.
   1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Section for miscellaneous record keeping requirements and submittals in connection with various construction activities. Submit one paper copy and annotated PDF electronic files and directories of each submittal.

E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
   1. Preparation: Mark record prints to show the actual installation where installation varies form that shown originally. Require individual or entity who obtained record data, whether individual or entity is installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an acceptable drawing technique.
      c. Record data as soon as possible after obtaining it.
      d. Record and check the markup before enclosing concealed installations.
      e. Cross reference record prints to corresponding photographic documentation.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.

b. Revisions to details shown on Drawings.
c. Depths of foundations.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directives.
k. Changes made following Architect's/Engineer's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information of the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked up record prints.
4. Mark record set with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from the original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked up record prints with Architect/Engineer. When authorized, prepare a full set of corrected digital data files of the Contract Drawings as follows:
1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
4. Refer instances of uncertainty to Architect/Engineer for resolution.
5. Architect/Engineer will furnish Contractor with one set of digital data files of the Contract Drawings for us in recording information.
   a. Architect/Engineer will provide data file layer information. Record markups in separate layers.

C. Format: Identify and date each record Drawings: Include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
   d. Name of Architect/Engineer.
   e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

A. Preparations: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications. addenda, and contract modifications.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Mark copy with the proprietary name and model number of products, materials and equipment furnished, including substitutions and product options selected.
   3. Record the name of manufacturer, supplier, installer, and other information necessary to provide a record of selections made.
   4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
   5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.

1.6 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until the end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that

END SECTION

SECTION 017900 – DEMONSTRATION AND TRAINING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Instruction in operation and maintenance of systems, subsystems, and equipment.

1.3 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative , complying with requirements in Section 01 40 00 "Quality Requirements", experienced in operation and maintenance procedures and training.

C. Pre-instruction Conference: Conduct conference at project site to comply with requirements in Section 01 31 00 "Project Management and Coordination". Review methods and procedures related to demonstration and training including, but not limited to, the following:
   1. Inspect and discuss locations and other facilities required for instruction.
   2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, and facilities needed to avoid delays.
   3. Review required content of instructions.
   4. For instructions that must occur outside, review weather and forecasted conditions and procedures to follow if conditions are unfavorable.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, ties, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect/Engineer.

1.5 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
   1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
      a. System, subsystem, and equipment descriptions.
      b. Performance and design criteria if Contractor is delegated design responsibility.
      c. Operating standards.
      d. Regulatory requirements.
      e. Equipment function.
      f. Operating characteristics.
      g. Limiting conditions.
      h. Performance curves.
   2. Documentation: Review the following items in detail:
      a. Emergency manuals
      b. Systems and equipment operation manuals
      c. Systems and equipment maintenance manuals
      d. Product maintenance manuals
      e. Project Record Documents
      f. Identification systems
      g. Warranties and bonds

h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.
5. Adjustments: Include the following:
   a. Alignments
   b. Checking adjustments
   c. Noise and vibration adjustments
   d. Economy and efficiency adjustments
6. Troubleshooting: Include the following:
   a. Diagnostic instructions
   b. Test and inspection procedures
7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning.
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.

8. Repairs: Include the following:
    a. Diagnosis instructions.
    b. Repair instructions.
    c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
    d. Instructions for identifying parts and components.
    e. Review of spare parts needed for operation and maintenance.

1.6 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 "Operation and Maintenance Data".

B. Set up instructional equipment at instruction location.

1.7 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program to coordinate instructors and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
    1. Owner will furnish an instructor to describe Owner's operational philosophy.
    2. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
    1. Schedule training with Owner, through Architect/Engineer, with at least seven (7) days advance notice.

D. Training Location and reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 02 41 19 – SELECTIVE DEMOLITION

PART 1 – GENERAL

A. Provide all labor, material, equipment, accessories, and incidentals necessary for the complete demolition, cutting, and shoring for areas indicated on plans and/or specifications.

B. The contractor shall take all necessary precautions to avoid damage to pavements, structural members, exterior and interior walls, floors and ceilings, windows, doors and all building/structure components to remain.

C. Contractor shall be completely liable for any damage incurred to the existing structure or as a result of demolition work. The contractor shall exercise extreme care so as to prevent damage to the building. The contractor shall be familiar with and exercise extreme care to load bearing walls, columns, etc.

D. All demolition work shall be subject to the documentation.

E. All demolition work shall be subject to local codes and the Engineer's directions. All materials shall be disposed of at the contractor's expense immediately after determination is made that the material will not be used.

F. Conditions at site: Contractor shall visit the site to examine the existing structure and conditions and note all conditions as to character and extent of work involved. Contractor shall inform the Engineer in writing of any conditions contrary to those indicated in the construction documents.

G. Permits, ordinances, etc.: Procure and pay for all necessary permits or certificates required to complete the work as specified. Make any and all required notifications and comply with all applicable federal, state and local codes, ordinances, and regulations associated with all work under this contract including but not limited to: demolition, temporary shoring, hauling and disposal regulations.

H. Quality assurance/regulatory requirements: Conform to applicable codes and regulations for demolition work, safety of structure, and dust control. Do not close or obstruct streets, walks, or other public right-of-ways without prior approval of authorities having jurisdiction. **If hazardous materials are discovered, notify Owner and Engineer and await instructions.** Minimize interference with streets, walks, other public right-of-

ways, and adjacent traffic.

I. Explosives: Use of explosives will not be permitted.

J. Burning**:** Burning will not be permitted.

K. Submittals: Submit shop drawings to indicate areas for demolition, removal sequence and location of salvageable items, as well as location and construction of temporary work.

PART 2 – LIMITED DEMOLITION

A. Remove all items shown on plans and any and all obstruction not here aforementioned, but which will interfere with demolition work. Consult Architect/Engineer for direction.

B. Remove existing construction to extend indicated and as necessary to join new work to existing. Do not remove more than is necessary to allow for new construction.

C. Review plans for areas and items of selective limited demolition. Remove all electrical, plumbing, and mechanical items abandoned or not to be used as noted on plans as necessary.

D. **If any of the following conditions are encountered, cease work immediately, notify Architect/Engineer, and await instructions**.

a. Structure is in danger of movement or collapse.

b. Materials or conditions encountered differ from those designated in the contract documents.

c. Materials or conditions encountered contain asbestos (ACM's), polychlorinated by phenyl (PCB's), lead based paints or other suspected hazardous materials. Protect affected areas from damage and notify Owner and Architect/Engineer immediately.

E. Assign work to trades skilled in the procedures involved.

F. Plug ends of disconnected utilities with threaded or welded caps.

G. Any original materials removed and scheduled for reuse shall be placed in suitable containers, labeled, and stored for future use.

PART 3 – MATERIALS

A. Salvage Materials:

1. Any materials that are to be removed and reused shall be cleared of all projecting nails or fasteners and shall be separately stored and clearly labeled. Materials shall be stored in a secure, dry location, sufficiently off the floor/ground.

2. Any existing fixtures or equipment to be removed, which have been identified by Owner to remain the property of the Owner, shall be moved and safely stored away from all construction and demolition operations and activity in an area designated for temporary storage.

3. Disposal of removed material: All material removed under this contract, which is not to be salvaged, reused, or stored for Owner shall become the property of the contractor and be promptly removed from the site, excluding those items that remain the property of the Owner. Material and equipment to be removed shall not be viewed by prospective purchaser or sold on the site.

B. Existing Facilities to be Removed:

1. Remove indicated walls, partitions and portions thereof.

2. Utilities related to equipment: remove existing utilities indicated on drawings and terminate in a manner confirming to the nationally recognized code covering the specific utility and at a time satisfactory to the local regulatory authorities. Re-use all existing conduit, refrigerant lines, and other utility lines which are appropriate for reuse. Re-route utility lines where equipment is relocated and/or as indicated on drawings.

PART 4 – EXECUTION

A. All demolition shoring, barriers and salvage shall be performed in a safe manner, in accordance with the latest OSHA regulations.

B. Protection:

1. Portion of existing facility may continue to be occupied by Owner and render services at the site. All precautions to be taken at occupied areas and all work to be coordinated with Owner and

Architect/Engineer to minimize downtime and to allow business activities to continue uninterrupted or with minimal acceptable interruptions.

2. Barricade and cover as necessary to protect pedestrians, workmen, and adjacent areas. Protect any existing active service lines whether indicated or not. Provide for the disconnection of electrical, telephone, gas, or other lines servicing the structures per rules and regulations of authorities having jurisdiction.

3. Wherever necessary for the protection of workmen and others; wall, partitions or ceiling being demolished shall be shored or braced. **Structural or load supporting members SHALL NOT be cut or removed without appropriate temporary shoring**. Additional temporary shoring shall be installed where it becomes necessary.

4. Execute all demolition work in an orderly and careful manner with due consideration for existing structures, including any parts of the surrounding areas which are to remain. Barricade and cover all necessary to protect pedestrians, workmen and adjacent area. Protect any existing active service lines, indicated or not.

5. Avoid any encroachment on adjacent areas. Repair and make good any damage to the adjoining areas or improvements caused by operations, including any damage or loss to adjoining property owners, whether to buildings, or property.

6. Provide temporary walls for dust protection as required. Limit noise of demolition work to the greatest extent possible. If noise levels are considered excessive ty the Owner, or Architect/Engineer, the contractor will be required to continue that specific operation at different hours.

7. Conduct operations so as to not interfere with activities at occupied portion of site.

8. Existing Work: Protect existing work which is to remain in place, that is to be reused, or which is to remain the property of the Owner by temporary covers, shoring, bracing and supports. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal work.

9. Weather Protection: Protect building interior and all materials and equipment from the weather at all times including through walls, openings and roof.

10. Personnel: Where pedestrians, Owner's employees, students, customers and/or driver safety is endangered in the area of removal or construction/re-construction, use traffic barricades with flashing lights or other adequate protective temporary structures, and notify the proper authorities prior to beginning any such work.

11. Facilities: Protect all electrical and mechanical services and utilities. Where removal of existing utilities is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities.

C. Noise and Dust Control: Conduct work to minimize noise and spread of dust and debris. Take appropriate action to check the spread of dust and debris to avoid the creation of a nuisance in the surrounding areas. Do not use water if it results in hazardous or objectionable conditions, such as flooding or pollution. Comply with all regulations imposed by local air pollution agencies.

D. Filling: Property fill holes and other hazardous openings.

E. Clean Up: Remove and transport debris and rubbish in a manner that will prevent spillage on streets or adjacent areas. Clean-up any spillage from streets and adjacent areas. On completion of demolition work, leave the property and adjacent areas in a clean condition satisfactory to local authorities, the Owner, and the Architect/Engineer.

END OF SECTION

SECTION 03 10 00 – CONCRETE FORMING AND ACCESSORIES

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Formwork for cast in place concrete, with shoring, bracing and anchorage.
B. Form accessories.
C. Form stripping.

1.2 RELATED REQUIREMENTS

A. Section 03 20 00 – Concrete Reinforcing
B. Section 03 30 00 – Cast in Place Concrete
C. Section 03 39 00 – Concrete Curing
D. Section 04 20 00 – Unit Masonry: Spacing for veneer anchor reglets recessed in concrete

1.3 REFERENCE STANDARDS

A. ACI 117 – Standards Specifications for Tolerances for Concrete Construction and Materials; Latest Edition.
B. ACI 301 – Specifications for Structural Concrete for Buildings; American Concrete Institute; Latest Edition.
C. ACI 318 – Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute; Latest Edition.

1.4 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.5 SUBMITTALS

A. See Section – Administrative Requirements, for submittal procedures.
B. Manufacturer's Literature: Submit copies of manufacturer's product specifications and installation instructions for manufactured products, including form sealer and release agent.
C. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.
D. Shop Drawings for formwork where concrete is exposed to view that show form construction including jointing, special form joint or reveals,

location and pattern of form tie placement and other items that become a feature of the wall.

1.6 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.
B. Maintain one copy of each installation standard on site throughout the duration of concrete work.
C. Industry Standards
   1. American Concrete Institute, ACI-301, Specifications for structural concrete for buildings.
   2. American Concrete Institute, ACI-318, Building code requirements for reinforced concrete.
   3. American Concrete Institute, ACI-347, Recommended practice for concrete formwork.
   4. American Concrete Institute, ACI-SP-15, Field reference manual.
   5. Southern Pine Inspection Bureau (SPIB) Grading Rules.
   6. Western Wood Products Association (WWPA) Grading Rules.
   7. American Plywood Association (APA) Grading Rules.
D. Allowable Tolerances: Construct formwork within tolerance requirement of ACI 347 – or as approved by Engineer. Maximum deflection of form facing material between supports shall be limited to 0.0025 x span.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for design, fabrication, erection and removal of formwork.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver void forms and installation instructions in manufacturer's packaging.
B. Store void forms off ground in ventilated and protected manner to prevent deterioration from moisture.

PART 2 – PRODUCTS

2.1 FORMWORK – GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions.
C. Comply with applicable State and local codes with respect to design, fabrication, erection, and removal of formwork.

2.2 WOOD FORM MATERIALS

A. Forms for Exposed Finish Concrete: Plywood with Formica faced; or other acceptable panel-type materials to provide continuous straight, smooth, exposed surfaces. Furnish in largest practicable size to minimize number of joints and to conform to joint system shown on drawings.
B. Forms of Unexposed Finish Concrete; Plywood timber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and side for tight fit.
C. Forms for Textured Finish Concrete: Units of face design, size arrangement, and configuration to match Architect/Engineer's control sample. Provide solid backing and firm supports to ensure stability of textured form liners.
D. Forms for Cylindrical Columns: Metal, fiberglass-reinforced plastic, paper or fiber tubes with Formica interior face. Provide paper of fiber tubes of laminated plies with water-resistant adhesive and wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.
E. Form Coatings; Sealers and Release Agents: Provide commercial formulated form-coating compounds that will not bond with, stain or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces. Use single source for all forms.
F. Form Ties: Factory fabricated, adjustable length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units that will leave no metal closer than 1 ½ inches to exposed surface. Spreader cones on ties shall not exceed 1 inch in diameter.
G. Earth Forms: Forms for footings may be cut into earth provided that earth is dry, stable, level and sound. Provide full depth forming at all perimeter grade beams and footings exterior faces.

2.3 PREFABRICATED FORMS

A. Manufacturers:
   1. Alabama Metal Industries Corporation: www.amico-online.com
   2. Molded Fiber Glass Construction Products Co: www.mfgcp.com
   3. Reward Wall Systems: www.rewardwalls.com

4. Substitutions: See Section – Product requirements.

B. Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set; 2 inches thick.

2.4 FORMWORK ACCESSORIES

A. Form Ties: Removable type, galvanized metal, fixed length, with waterproofing washer, free of defects that could leave holes larger than 1 inch in concrete surface.
B. Form Release Agent: Colorless mineral oil that will not stain concrete.
C. Flashing Reglets: Galvanized steel, 22 gauge thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.
D. Waterstops: Preformed mineral colloid strips, 3/8 inch thick, moisture expanding.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.2 ERECTION – FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
C. Arrange and assemble formwork to permit dismantling and strip. Do not damage concrete during stripping. Permit removal of remaining principle shores.
D. Coordinate this section with other sections of work that require attachment of components to formwork.
E. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instruction from Engineer before proceeding.
F. General: Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment,

elevation and position. Maintain formwork construction tolerances complying with ACI 347.

G. Construct forms to sizes, shapes, lines, and dimensions shown and obtain accurate alignment, locations, grades, level, and plumb work in finished structures. Provide for openings, offsets, keyways, rustications, chamfers, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.
H. Fabricate forms for easy surface removal without hammering or prying against concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for easy removal.
I. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection and for placement of concrete. Locate temporary openings in forms at inconspicuous locations.
J. Chamfer exposed corners and edges as indicated, using wood, metal, PVC of rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

3.3 APPLICATION – FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
B. Apply prior to replacement of reinforcing steel, anchoring devices, and embedded items.
C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.
D. Forms coated to prevent bond with concrete shall be done in accordance with manufacturer's instructions. Materials which will stain or discolor the concrete shall not be applied to the form surfaces.

3.4 FORM CLEANING

A. Clean forms as erection proceeds to remove foreign matter within forms.
B. Clean formed cavities of debris prior to placing concrete.
C. Thoroughly clean forms and adjacent surfaces to recure concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing before concrete placement as required to prevent mortar leaks and maintain proper alignment.

3.5 FORM TOLERANCES

A. Construct formwork to maintain tolerances required by AC 117.
B. Construct and align formwork for elevator hoist way in accordance with ASME A17.1

3.6 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests.

3.7 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
B. General: Formwork not supporting weight of concrete such as sides of walls and slabs may be removed after cumulatively curing at not less than 50 degrees for 48 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing protection operations are maintained.
C. Contractor shall assume full responsibility for removal of formwork and forms shall be removed in such a manner as to insure complete safety of structure.

END OF SECTION

SECTION 03 20 00 – CONCRETE REINFORCING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.
B. Supports and accessories for steel reinforcement.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast in Place Concrete

1.3 REFERENCE STANDARDS

A. ACI 301 – Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005
B. ACI SP-66 – ACI detailing Manual; American Concrete Institute International; 2004.
C. ASTM A 185/A 185M – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.
D. ASTM A 615/A 615M – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2007.
E. CRSI (DA4) – Manual of Standard Practice; Concrete Reinforcing Steel Institute; 2001.

1.4 SUBMITTALS

A. See Section – Administrative Requirements, for submittal procedures.
B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

1.5 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301

PART 2 – PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ADTM A 615/A 615M Grade 60 (420)
    1) Deformed billet-steel bars.

2) Unfinished.

B. Steel Welded Wire Reinforcements: ASTM A 185/A 185M, plain type.
   1) Flat Sheets.
   2) Mesh Size: 4 x 4.
   3) Wire Gage: W2.9 x W2.9 or as indicated on the plans.

C. Reinforced Accessories:
   1) Tie Wire: Annealed, minimum 16 gage.
   2) Chairs, Bolsters, Bar Supports, and Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3) Provide stainless steel or plastic components for placement within 1 ½ inches of weathering surfaces.

2.2 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) – Manual of Standards Practice.
B. Welding of reinforcement is not permitted.

PART 3 – EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
B. Do not displace or damage vapor barrier.
C. Accommodate placement of formed openings.
D. Maintain concrete cover around reinforcing as follows:
   1) Footings and Concrete Formed Against Earth: 3 inch.
   2) Slabs on Fill: 2 inch
E. Conform to applicable code for concrete cover over reinforcement.

END OF SECTION

SECTION 033000- CAST IN PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Labor, materials, services and equipment required in conjunction with or properly incidental to placing of cast-in-place concrete slabs, building members, and MEP equipment pads as described herein or as shown on the Drawings, including but not limited to:
   1. Concrete mix designs.
   2. Assistance with Owner provided laboratory testing of concrete.
   3. Installation of items to be built-in formwork or embedded in concrete but furnished by other trades, including metal anchors, anchor slots, reglets, hangers, supports, ties, inserts, bolts, corner guards, and sleeves.
   4. Cast-in-place concrete, with formwork, under slab vapor barrier, reinforcing, accessories, appurtenances, finishing and curing required completing concrete work.
   5. Grouting under structural steel base plates.
   6. Foundation for columns, walls, and slabs on grade.
   7. Super-structure for walls, columns, slabs, curbs, stairs, steps, equipment pads, walks, and pre-molded expansions joints.

B. Examine the drawings for Plumbing, Mechanical, and Electrical work. These subcontractors will furnish and set sleeves or box forms required for openings. Contractor shall use care in placing reinforcement and pouring concrete so as not to displace such sleeves or boxes.
   1. All slots, chases, recesses, or openings indicated on the drawings, which are not formed by sleeves or boxes shall be provided in locations shown. When the work of other contractors is completed, the excess part of the openings shall be completely closed with concrete.

1.2 RELATED REQUIREMENTS

A. Division 1 Sections applicable to the Work of this Section.

1.3 RELATED SECTIONS

A. Section - Testing and Inspecting Services

B. Section 04 20 00 - Unit Masonry

C. Section 05 12 00 - Structural Steel

D. Section 05 50 00 - Miscellaneous Metals

E. Section 31 00 00 – Earthwork

F. Electrical and Mechanical Drawings and Specifications for sleeves, conduit, and other items embedded in concrete.

1.4 QUALITY ASSURANCE

A. Where standards or requirements of this Section are in conflict with those noted on the Contract Drawings, or the Building Code, the more stringent requirements shall govern. Bring all conflicts and discrepancies to the attention of the Architect/Engineer and do not start work until such conflicts and discrepancies are clarified and corrected. Failure to do so will not relieve the Contractor from performing the Work correctly at no additional expense to the Owner.

B. Testing Laboratory Services:
   1. Test results shall meet or exceed established standards. A technician from the Owner's Testing Laboratory must be present during all operations.

C. Evaluation and Acceptance:
   1. Codes and Standards: The Work described in this Section, unless otherwise noted on the Drawings, or herein specified, shall be governed by the editions of the following codes or specifications approved by authorities having jurisdiction.
      a. American Association of State Highway and Transportation Officials (AASHTO)
         1) TP 23, "Proposed Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying"
      b. American Concrete Institute (ACI)
         1) 211.1, "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete"
         2) 214, "Recommended Practice for Evaluation of Strength Test Results of Concrete"
         3) 301, "Specifications for Structural Concrete for Buildings"
         4) 302, "Guide for Concrete Floor and Slab Construction"
         5) 304, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete"
         6) 305, "Hot Weather Concreting"
         7) 306, "Cold Weather Concreting"

8) 309, “Standard Practice for Consolidation of Concrete”
9) 311, “ACI Manual of Concrete Inspection”
10) 315, “Manual of Standard Practice for Detailing Reinforced Concrete Structures”
11) 318, “Building Code Requirements for Reinforced Concrete”
12) 347, “Recommended Practice for Concrete Formwork”
13) Keep one copy of “Manual of Concrete Practice” at job site at all times.

c. American Society for Testing and Materials (ASTM)
1) A36, Standard Specification for Carbon Structural Steel
2) A108, Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality
3) A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
4) A185, Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
5) A615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
6) A704, Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
7) C33, Standard Specification for Concrete Aggregate
8) C42, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
9) C94, Standard Specification for Ready-Mix Concrete
10) C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates
11) C150, Standard Specification for Portland Cement
12) C172, Standard Practice for Sampling Freshly Mixed Concrete
13) C260, Standard Specification for Air-Entraining Admixtures
14) C330, Standard Specification for Lightweight Aggregates for Structural Concrete
15) C494, Standard Specification for Chemical Admixtures for Concrete
16) C595, Standard Specification for Blended Hydraulic Cements
17) C881, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
18) C979, Standard Specification for Pigments for Integrally Colored Concrete
19) C1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)
20) C1315, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete

21) E96, Standard Test Methods for Water Vapor Transmission of Materials
22) E1643, Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs
23) E1745, Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
24) F710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

d. Federal Specification (FS)
   1) D1.4 Structural Welding Code- Reinforcing Steel
e. Federal Specification (FS)
   1) FF-S-325
   2) QQ-Z-325C
f. Concrete Reinforcing Steel Institute (CRSI)
   1) "Reinforced Concrete – A Manual of Standard Practice"
   2) "Recommended Practice for Placing Reinforcing Bars"
   3) "Recommended Practice for Placing Bar Supports"

D. Source Quality Control:
1. Concrete production facilities shall meet the requirement for certification by the National Ready Mixed Concrete Association. All ready mix concrete trucks proposed for use on the project shall meet the requirements of NRMCA, Certification of Ready Mix Concrete Production Facilities.
2. Concrete batchers shall be completely interlocked semi-automatic or automatic batchers, as defined by the Concrete Plant Manufacturers Bureau.
3. Concrete batchers shall have graphic, digital, or photographic recorders, which shall register both empty balance and total weight (or volume of water or admixture) of each batched material, time to the nearest minute, date, identification of batch, and numerical count of each batch. Copies of the record shall be furnished to the Inspection and Testing Laboratory.
4. The Inspection and Testing Laboratory shall provide concrete batch plant inspection as follows:
   a. Provide a qualified inspector with necessary equipment and apparatus to inspect weighing and batching of controlled concrete at batch plant on a random basis, approximately once daily as the concrete is being placed on this project.
   b. Make certain that materials and batch equipment used are in accordance with requirements of Specifications.
   c. Check for adjustment in batch weights to compensate for variations in moisture content.

d. Submit promptly to Architect/Engineer, certification of weights used in loads of acceptable concrete which has been batched during plant inspection time.

E. Concrete Mix Design Criteria:
1. Design concrete mixes in accordance with ACI 318, Section 5.3, and proportioning on the basis of field experience and/or trial mixtures.
2. Submit the proposed mix designs for each concrete mix type proposed.
3. Determination of required average strength above specified strength shall be in accordance with ACI 318.
4. If trial mixes are used as the basis for the proposed mix design, mold and cure test cylinders in accordance with ASTM C39. Do not place concrete on project until laboratory reports and results of confirmation cylinder tests have been evaluated by the Inspection and Testing Laboratory and results indicate that proposed mixes will develop required strengths.
5. Inspection and Testing Laboratory shall furnish the Architect/Engineer with a written evaluation of each proposed concrete mix design submitted by the Contractor.
6. Check mix designs and revise if necessary wherever changes are made in aggregates or in surface water content of aggregate or workability of concrete. Water content shall be the minimum to produce workable mix. The water content shall be verified in the field by use of the Microwave Test.

1.5 SUBMITTALS

A. Mix Designs: Submit proposed mix designs, including confirmation cylinder test results, in accordance with ACI 318, Section 5.3, Proportioning on the basis of field experience and/or trial mixtures. Submit mix designs to Architect/Engineer and Inspection and Testing Laboratory for evaluation a minimum of 14 days prior to placing concrete. Key requirements:
1. Combined aggregate gradation.
2. Proportions of cement, fine and coarse aggregates, and water.
3. Type, color and dosage of integral coloring compounds, where applicable.
4. Range of ambient temperature and humidity for which design is valid.
5. Any special characteristics of mix which require precautions in mixing, placing, or finishing techniques to achieve finished product.

B. Complete test data for trial mixes or a complete summary of previous project test results for mix design based on standard deviation analysis must be included.

C. Provide duplicate delivery tickets for each load of ready-mix concrete delivered to site, in accordance with ASTM C94. Show batch weights on each ticket.

D. Provide mill test reports on an as-used basis for each type and brand of cementitious material used. Provide certification from independent test laboratory indicating underslab vapor retarder compliance with specification and ASTM 1745 Class A requirements.

E. Provide product data for each accessories item specified but not necessarily listed above, which are required for a complete installation, including, but not limited to reinforcing, chairs, admixtures, stains and color pigments, grouts, sealers, vapor retarders and barriers, water stops, epoxy adhesives, curing compounds and anchors.

F. Provide Shop Drawings for all reinforcing steel. Show bending diagrams, splicing and laps of rods, shapes, dimensions and details of bar reinforcement and accessories.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Mix and deliver concrete to project ready-mixed in accordance with ASTM C94. Mix concrete a minimum of 70 revolutions of transit mix drum at mixing speed. A minimum of 40 revolutions shall be at the production plant.
B. Schedule delivery so that continuity of any pour will not be interrupted for over 15 minutes.
C. Place concrete on site within 90 minutes after proportioning materials at batch plant.
D. Store bagged cement on platforms off ground. Protect stored cement against the elements. Handle and store fine and coarse aggregate separately in manner to prevent intrusion of foreign material or segregation of the material. Protect all reinforcement until used. Do not use any hardened cement.
E. Mild steel reinforcement at the time of placement of concrete shall be clean and free of all loose dirt, form oil, and other coatings affecting bond.

1.7 JOB CONDITIONS

A. Hot Weather Concreting:
   1. Follow ACI 301 and ACI 305.
   2. Provide water-reducing retarding admixture conforming to ASTM C494, Type D when necessary to retard initial set. The admixture shall be dispensed in accordance with manufacturer's recommendations.
   3. Maximum concrete temperature shall not exceed 95 degrees F at time of placement.
      a. Concrete with temperatures above 90 degrees F shall be placed only if a high range water reducer (superplasticizer) is added to the mix as directed by the Testing Laboratory to maintain the specified slump during placement.

B. Cold Weather Concreting: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures.
   1. Follow ACI 301 and ACI 306.
   2. When ambient temperature at site is below 40 degrees F or is expected to fall to that temperature within ensuing 24 hours, heat water and/or aggregate prior to adding to mix so that temperature of concrete will be between 55 degrees F and 85 degrees F at time of placement.
   3. Maintain temperature of deposited concrete between 50 degrees F and 70 degrees F for minimum of seven (7) days after placing.
   4. Add the specified non-corrosive accelerator for all floor concrete placed at air temperatures below 50 degrees F.

C. Temperature Changes: Maintain changes in concrete temperature as uniformly as possible, but in no case exceed change of 5 degrees F per hour or 25 degrees F in any 24 hour period.

D. Combustion heaters shall not be used during the first 48 hours without precautions to prevent exposure of concrete and workmen to exhaust gasses containing carbon dioxide and/or carbon monoxide.

E. Admixtures intended to accelerate hardening of concrete or produce higher than normal strength at early periods will not be permitted unless approved by the Architect/Engineer. The use of calcium chloride is specifically prohibited.

1.8 PRE-INSTALLATION CONFERENCE

A. Refer to Section – Project Coordination

1.9 SEQUENCING/SCHEDULING

A. Coordinate Work of this Section with work of other Sections as required

to properly execute the Work and as necessary to maintain satisfactory progress of the work of other Sections.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Manufacturers named within this Section are approved for use on the Project for the product for which they are specified. Other manufacturers must have a minimum of five (5) years' experience manufacturing the product specified and meet or exceed the specifications for that product. Substitution of products must be in accordance with the General Conditions, Supplementary Conditions, and Section 01 30 00, Submittals to be considered prior to proposal.

2.2 MATERIALS

A. Formwork:
   1. General: Contractor may use any of the following formwork materials as long as material meets the following and will not stain, or impart any undesirable texture, i.e. wood grain, where such texture would be objectionable in an exposed location.
      a. Wood Forms:
         1) Plywood: PS 1, Douglas Fir or Spruce species.
         2) Medium Density Overlay (MDO): One (1) side grade; sound undamaged sheets with clean, true edges.
         3) Lumber: Southern Yellow Pine species; No. 2 grade, with grade stamp clearly visible.
      b. Pre-Fabricated Forms:
         1) Preformed Steel Forms: Minimum 16 gauge matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
         2) Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
      c. Form Liner: Any material recommended by manufacturer to impart finish which will exhibit the finish or design characteristics, i.e. smooth, textured, ribbed, etc. detailed by the Architect/Engineer for exposed locations as shown or required and capable of being stripped from complex designs without damaging the finish or design. Form liner shall be as

manufactured by Symons Corporation, Greenstreak, Inc. or Architect/Engineer approved equal.

d. Self-expanding corkboard expansion joint fillers should conform to ASTM D1752 for exterior work. Joint fillers shall extend full depth of slab or joint and be of thickness and lengths indicated on drawings.

B. Metal Reinforcement:
   1. Bars:
      a. General: Conform to ACI 315, latest edition.
      b. Comply with ASTM A615, Grade 60.
      c. Number 3 bars comply with ASTM A615, Grade 40
   2. Welded Steel Wire Fabric (Mesh): Not permitted in structural concrete, unless approved by Structural Engineer

C. Concrete, General:
   1. Ready-mixed concrete, ASTM C94
   2. Comply with ACI 318.
   3. Concrete must be approved by Architect/Engineer through design mix and cylinder test of testing laboratory.
   4. Unless approved otherwise by the Architect/Engineer, use one (1) brand of cement throughout the work where finished surface will be exposed to view.
   5. Strength: Refer to Paragraph 2.3, A.
   6. Unless approved otherwise by the Structural Engineer, use one (1) ready-mix concrete company throughout the project.

D. Concrete Materials:
   1. Cement:
      a. Portland Cement, Type I or III, conforming to the requirements of ASTM C150.
      b. Combined aggregate gradation for slabs and other designated concrete shall be 8 percent - 18 percent for large top size aggregates (1-1/2 in.) or 8 percent - 22 percent for smaller top size aggregates (1 in. or 3/4 in.) retained on each sieve below the top size and above the No. 100.
   2. Fly ash: Maximum of 25% fly ash by weight is acceptable.

E. Aggregate:
   1. Fine Aggregate: ASTM C33; clean, hard, durable, uncoated, natural and manufactured sand, free of silt, loam or clay.
   2. Coarse Aggregate: ASTM C33; hard, durable, uncoated, crushed stone; gradation in accordance with Size No. 467 for piers and concrete footings and Size No. 67 for all other concrete. Maximum aggregate size in accordance with ACI 318.
   3. Grading shall be in accordance with "Standard Method for Fine Analysis of Sieve and Coarse Aggregates" (ASTM C136).

F. Water: ASTM C94, Paragraph 4.1.3; potable, clean and free from oil, acid and injurious amount of vegetable matter, alkalies, and other impurities.

G. Admixtures:

1. Cement-dispersing, water-reducing types. Admixtures shall conform to ASTM C494, Type A or D, and shall be used strictly in accordance with manufacturer's recommendations and as determined by the Inspection and Testing Laboratory. Admixture shall not discolor concrete or in any way affect the appearance of the concrete.
   a. High-range water reducing admixture conforming to ASTM C494, Type F or G shall be used as required and shall be one (1) of the following or Architect/Engineer approved equal:
      1) Eucon 37 (Type F), Eucon 537 (Type G) by The Euclid Chemical Company
      2) Rheobuild 1000 (Type F), Rheobuild 716 (Type G) by Master Builders
      3) Sikament 300 (Type F), Sikament 86 (Type G) by Sika Chemical Corp.
      4) WRDA-19 (Type F), Daracem 100 (Type G) by W.R. Grace
2. An air-entraining admixture conforming to ASTM C260 shall be used as required on the Drawings and shall be one (1) of the following or Architect/Engineer approved equal:
   a. Air-Mix or AEA-92 by The Euclid Chemical Company
   b. Sika Aer by Sika Corporation
   c. MB-VR or MB-AE by Master Builders
3. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.
4. Certification: Written conformance to the above-mentioned requirements and the chloride ion content of admixtures will be required from the admixture manufacturer prior to mix design review by the Architect/Engineer.

H. Non-Shrink Cement Grout:

1. The non-shrink grout shall be a factory pre-mixed grout and shall conform to ASTM C1107, “Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink).” In addition, the grout manufacturer shall furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent bearing under a 4 foot x 4 foot base plate. Provide one (1) of the following or Architect/Engineer approved equal:
   a. NS Grout by The Euclid Chemical Company
   b. Five Star Grout by U.S. Grout Corp.
   c. Horn Non-Corrosive Non-Shrink Grout by Tamms Industries

d. Duragrout by L & M Construction Chemicals, Inc.
e. Masterflow 713 by Master Builders
f. SikaGrout 212 by Sika Corp.
g. Sonogrout 10K by Sonneborn
h. 588 Grout by W. R. Meadows, Inc.
i. US SPEC GP Grout by US Mix Products Company

2. High Flow Grout: Where high fluidity and/or increased placing time is required, use high flow grout. The factory pre-mixed grout shall conform to ASTM C1107, "Standard Specification for Packages Dry, Hydraulic-Cement Grout (Non-Shrink)." In addition, the grout manufacturer shall furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent bearing under an 18 inch x 36 inch base plate. Provide one (1) of the following or Architect/Engineer approved equal:
   a. Hi-Flow Grout by The Euclid Chemical Company
   b. Crystex by L & M Construction Chemicals, Inc.
   c. Masterflow 928 by Master Builders
   d. CG-86 Grout by W. R. Meadows, Inc.
   e. US SPEC MP Grout by US Mix Products Company

I. Evaporation Retardant:
   1. Evaporation Retardant shall be a thin, continuous film which prevents rapid moisture loss from the concrete surface. For use when concrete operations must be performed in direct sun, wind, high temperatures, or for relative humidity. Products: Subject to compliance with requirements, provide one (1) of the following or Architect/Engineer approved equal:
      a. Eucobar by The Euclid Chemical Company
      b. Confilm by Master Builders
      c. Evapre by W. R. Meadows, Inc.
      d. US SPEC Monofilm ER by US Mix Products Company.
      e. E-Con by L& M Construction Chemicals

J. Sealer/Densifier: Provide "Euco Diamond Hard" by The Euclid Chemical Company, "Sealhard" by L&M Construction Chemicals, or equal by Master Builders, Sika Corp., Sonneborn, US SPEC, or Architect/Engineer approved equal.

K. Chemical Hardener/Dustproofer: Provide "Surfhard" by The Euclid Chemical Company, "Chemhard" by L&M Construction Chemicals, or equal by Master Builders, Sika Corp., Sonneborn, US SPEC, or Architect/Engineer approved equal.

L. Curing Compound: dissipating resin type, which chemically breaks down after approximately eight (8) weeks. Membrane forming compound shall meet ASTM C309, Types 1 and 1D Class B, water based, VOC/AIM Compliant. Provide "Kurez DR VOX" by The Euclid

Chemical Company, "Cure R" by L&M Construction Chemicals, "1100 Clear" by W. R. Meadows, Inc., US SPEC "Maxcure Resin Clear" by US Mix Products Company, or equal by Master Builders, Sika Corp., BASF, or Architect/Engineer approved equal.

M. Curing and Sealing Compound: high solids acrylic copolymer emulsion blend. Membrane forming compound shall meet ASTM C1315, Type 1 Class B. Provide "Super Rez-Seal" by The Euclid Chemical Company, "Dress & Seal" by L&M Construction Chemicals, "VOCOMP 25 1315" by W. R. Meadows, Inc., US SPEC "CS-25-1315" by US Mix Products Company, or equal by Master Builders, Sika Corp., BASF, or Architect/Engineer approved equal.

N. Epoxy Adhesive: ASTM C881, two (2) components, 100 percent solids, 100 percent reactive compound suitable for use on dry or damp surfaces. Provide one (1) of the following or Architect/Engineer approved equal:
   1. Euco #452 Epoxy System or Euco #620 Epoxy System by the Euclid Chemical Company
   2. Sikadur Hi-Mod by Sika Corp.
   3. Rezi-Weld 1000 by W. R. Meadows, Inc.
   4. US SPEC Maxibond 2500 by US Mix Products Company.
   5. Epobond by L& M Construction Chemicals.

O. Underslab Vapor Retarders and Barriers:
   1. Vapor Retarder Membrane:
      a. Requirements:
         1) Class: ASTM E1745, Class A.
         2) Water Vapor Permeance: ASTM E96, 0.01 perms maximum.
         3) Tensile Strength: ASTM E154 (Section 9, Average), 45.0 pounds per inch, minimum.
         4) Puncture Resistance: ASTM D1709 (Method B), 2300 grams, minimum.
      b. Provide compatible seam taping and pipe boots or sealing mastic in accordance with manufacturer's requirements.
      c. Provide proof of compliance to Architect/Engineer at time of delivery of materials.
      d. Provide one (1) of the following under entire slab, unless noted otherwise:
         1) Stego Wrap 15-mil Vapor Barrier by STEGO INDUSTRIES LLC, San Juan Capistrano, CA (877) 464-7834 www.stegoindustries.com
         2) Premoulded Membrane with Plasmatic Core by W.R. Meadows.
         3) Zero-Perm by Alumiseal.
   2. Vapor Barrier: Under Wood Floors at Gymnasiums, Stages, and Dance Floors, and at Auditorium Areas Below Finish Floor Level:

Premoulded Membrane Vapor Seal with Plasmatic Core manufactured by W.R. Meadows, Inc., Hempshire, IL; or Architect/Engineer approved equal.

3. Below Grade Waterproofing: Provide below grade waterproofing at vertical walls below grade.

P. Miscellaneous Structural Metals Associated with Structural Concrete:
   1. Structural steel pieces, including miscellaneous structural metals placed in concrete, exposed to weather, in permanent contact with soil, or accessible to salt intrusion shall be hot dipped galvanized in accordance with ASTM A123.
   2. Structural steel pieces embedded in concrete shall conform to ASTM A36, unless noted otherwise on the Drawings.
   3. Welding of inserts, anchors and other steel pieces used in conjunction with structural concrete shall conform to AWS Dl.4.
   4. Welding of reinforcing steel used in conjunction with structural concrete shall conform to AWS Dl.4.
   5. Headed stud anchors shall conform to ASTM A108, minimum tensile strength 60,000 PSI.
   6. Concrete expansion anchors shall be wedge-type anchors, meeting the requirements of FS FF-S-325, Group 11, Type 4, Class 1, plated in accordance with FS QQ-Z-325C, Type 11, Class 3. Size and location shall be as indicated on the Drawings. Products shall be by Hilti Corp., Powers Fasteners, Inc. or Architect/Engineer approved equal.

Q. Miscellaneous Materials and Accessories:
   1. Form ties: Adjustable length and type which will not leave holes larger than 1 inch in diameter in face of concrete. Ties shall be such that when forms are removed, no metal will be within 1 inch of the finished concrete surface. The holes must be patched.
   2. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages, Fasteners: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
   3. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture.
   4. Chairs and Spacers: Heavy-duty plastic-type sized to support all reinforcing steel to proper height. Use type with sand cushion pads where concrete is on grade. Provide chairs and spacers Series "B" by W.H.C. Products, Inc., E-Z Chair by Aztec Concrete Accessories, Inc., GTI Bar Chair by General Technologies, Inc., or Architect/Engineer approved equal.
   5. Waterstops:
      a. Ribbed flat 3/16 inch by six (6) inch with 1/8 inch ribs, rated for 75 foot of head pressure. Provide factory made corner fittings weld

splices with thermostatically controlled heating iron. Style No. 782 by Greenstreak, Inc., or Architect/Engineer approved equal.

b. Contractor's Material Option: Specially formulated preformed joint sealant that provides a lasting, watertight bond to both fresh and cured concrete surfaces. Synko-Flex Preformed Plastic Adhesive Waterstop and Synko-Flex Primer manufactured by Synko-Flex Products, Division of Henry Company, Houston, Texas; (713) 671-9502 or Architect/Engineer approved equal.

6. Carton Void Forms: If shown or required, shall be wax impregnated cardboard trapezoidal shape, with 1/8 inch thick tempered hardboard for top plane when requested by Architect/Engineer.
7. Corners: Chamfer, wood strip type; one (1) inch x one (1) inch size; maximum possible lengths.
8. Dovetail Anchor Slot: Galvanized steel, 22 gauge thick, foam filled, release tape sealed slots, anchors for securing to concrete formwork.
9. Flashing Reglets: Galvanized steel, 22 gauge thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.
10. Bonding Agent: Acrylic latex emulsion type as recommended for bonding new concrete to old concrete.
11. Integral Color Pigment (If shown or required): Mineral oxide, lightfast, lime-proof, water-resistant type conforming to ASTM C979. Color(s) shall be as selected by Architect/Engineer from manufacturer's standard color line. Provide one (1) of the following or Architect/Engineer approved equal:
    a. ChemSystems, Inc.
    b. Davis Colors
    c. New Riverside Ochre Co., Inc.
    d. L.M. Scofield Company
12. Color Stain (If shown or required): A chemically reactive stain, designed for adding variegated color to new or old concrete. Color(s) shall be as selected by Architect/Engineer from manufacturer's standard color line. Provide Lithochrome Chemstain by L.M. Scofield Company or Architect/Engineer approved equal.
13. Joint Sealants: Refer to Section 07 90 00, Building Sealants

2.3 CONCRETE MIXES

A. Strength: Concrete is classified and specified by ultimate compressive strength (f c) at the age of 28 days. Unless indicated otherwise on the Drawings, strengths shall be as follows:
    1. All concrete including grade beams, footings, slabs, and pads: 5 sack/3,000 psi/28 days.

2. Strength recommendations on Structural Drawings supersede when they are greater than specified here.

B. Interior slabs subjected to vehicular traffic: This concrete shall have a maximum W/cm of 0.48 and maximum air content of 3 percent. No air-entraining admixture shall be added to this mix.

C. Concrete permanently exposed to freezing and thawing shall contain an air-entraining admixture to produce 4.5 percent - 7.5 percent of air by volume of concrete.

D. Proportions: Proportions of cement, aggregate, admixture and water to attain required plasticity and compressive strength shall be in accordance with ACI 318, Section 5.3, Proportioning on the basis of field experience and/or trial mixtures. Do not make changes in proportions without submitting proposed changes to Inspection and Testing Laboratory for evaluation.
   1. Trial mixtures having proportions and consistencies suitable for the work shall be made based on ACI 211. 1, using at least three (3) different water-cement ratios which will produce a range of strengths encompassing those required for this project.
   2. Trial mixes shall be designed to produce a slump within 3/4 inch of the maximum permitted, and for air-entrained concrete, within 0.5 percent of maximum allowable air content. The temperature of concrete used in trial batches shall not exceed the maximum temperature specified.
   3. For each water-cement ratio, at least three confirmation compression test cylinders for each test age shall be made and cured in accordance with ASTM C192. Confirmation cylinders shall be tested at seven (7) and twenty-eight (28) days in accordance with ASTM C39.
   4. From the results of the twenty-eight (28) day confirmation tests, a curve shall be plotted showing the relationship between the water-cement ratio and compressive strengths. From this curve, the water-cement ratio to be used in the concrete shall be selected to produce the average strength required.
   5. The cement content and mixture proportions to be used shall be such that this water-cement ratio is not exceeded when slump is the maximum permitted. Control in the field shall be based upon maintenance of proper cement, water content, slump and air content.
   6. Mix designs furnished by the concrete supplier, shall be based on the standard deviation analysis of previous test records meeting the requirements of Section 5.3.1 - Standard deviation of ACI 318. These mixes will be accepted in lieu of trial mixtures described in paragraphs above.
      a. Temperature of concrete in test data shall be within 5 degrees F of maximum temperature specified for this project.

b. Strengths indicated in test data shall be in accordance with ACI 318, Section 5.3.
c. The specified strength of concrete used in supporting test data shall vary no more than 500 PSI plus or minus from that specified for this project.
d. The Testing Laboratory shall keep strength and standard deviation record of all concrete for the duration of the project as specified in this section.

PART 3 - EXECUTION

3.1 GENERAL

A. Inserts: Give the various trades and subcontractors ample notification and opportunity to furnish all anchors, nailers, pipes, conduits, boxes, inserts, thimbles, sleeves, frame vents, wires, supports, or other items required to be built into the concrete by the provisions of the Drawings or of the Specification governing the work of such trades and subcontractors, or as it may be necessary for the proper execution of their work. Obtain suitable templates or instructions for the installation of such items which are required to be placed in the forms.
B. Install under-slab vapor retarder as instructed by manufacturer in accordance with ASTM E1643. Penetrations shall be sealed to maintain integrity of barrier. Tape around all openings and seal all penetrations as instructed by the barrier manufacturer. Grade stakes shall not be driven through the vapor barrier. Avoid punctures during reinforcement and concrete placement.
C. Slump:
    1. Concrete not containing a high range water reducing admixture shall not be placed when its plasticity, as measured by slump test, is outside the following limits:
        a. Footings: 5 inches maximum, 4 inches minimum.
        b. All other Structural Concrete: 5 inches maximum, 4 inches minimum.
        c. Slump drop not to exceed 2 inches when pumped.
    2. Concrete containing a high range water reducing admixture shall not be placed when its plasticity, as measured by slump test, is outside the following limits:
        a. Prior to addition high range water reducer: 3 inches maximum, 2 inches minimum.
        b. After addition of high range water reducer: 9 inches maximum.

D. Classes of Concrete and Usage: Concrete of the several classes of concrete required shall have the characteristics shown on the Drawings.

E. Mixing:
   1. Transit-mixed concrete conforming to the requirements of ASTM C94 and ACI 304 shall be used in lieu of concrete mixed at the job site. Concrete shall not be transported or used in any case after a period in excess of 90 minutes has elapsed after the introduction of water into the mixer.
   2. Indiscriminate addition of water to increase slump of concrete is prohibited. Add water only at the direction of the Testing Laboratory. No water shall be added which increases the water cement ratio of the concrete in excess of the water cement ratio indicated on the approved mix design. At the direction of the Inspection and Testing Laboratory the addition of a high range water reducing admixture may be used to retemper concrete.
   3. The agency supplying transit-mixed concrete shall have a plant of sufficient capacity and adequate transportation facilities, to assure continuous delivery at the rate required. The frequency of deliveries to the site of the work must be such as to provide for placing the concrete continuously throughout any one (1) pour.

F. Conveying Concrete: Convey concrete from the mixer to the place of final deposit by methods which will prevent the separation or loss of the ingredients. Concrete to be conveyed by pumping shall be submitted to the Inspection and Testing Laboratory for evaluation for each class of concrete specified before being used. Test cylinders for pumped concrete shall be taken at the discharge end of the pumping equipment.

G. Equipment for chuting, pumping, and pneumatically conveying concrete shall be of such size and design as to assure a practically continuous flow of concrete at the delivery end without separation of the materials. The use of gravity-flow or aluminum chutes or conveyors for transporting concrete horizontally will not be permitted.

H. Miscellaneous Materials and Accessories: if not specifically noted, install all materials and accessories per manufacturer's instructions as if noted here in full.

I. Extend underslab vapor barrier continuously under entire slab, slab turn downs, vertical face of grade beams and footings to completely protect concrete adjacent to earth. Overlap joints and install seam tape and pipe boots, and seal penetrations as instructed by manufacturer.

J. Bars shall be supported on chairs or spacers on metal hangers, accurately placed and securely fastened to steel reinforcement in place. No wood or clay brick will be permitted inside forms.

K. All reinforcing shall be set in place, spaced, and rigidly and securely tied or wired at all splices and at all crossing points and intersections.
L. Minimum center to center distance between parallel bars shall be in accordance with the details on the drawings. Where not shown, the clear spacing shall be 1-1/2 times the bar diameter but never less than 1-1/2 inches.
M. Lap of splices where shown and noted on the drawings shall be a minimum of 32 bar diameters but never less than 12 inches.
N. Except where shown on the drawings, minimum concrete coverage for reinforcing steel shall be:
    1) 3 inches...where concrete is placed against earth
    2) 1-1/2 inches...over column ties
    3) 1-1/2 inches...for #5 and smaller bars in formed walls
    4) 2 inches...for all bars larger than #5 in formed walls
    5) 1 inch...for #11 and smaller bars in suspended slabs
    6) 1-1/2 inches...for all bars larger than #11 in suspended slabs

3.2 CONCRETE CONTROL AND TESTING

A. Inspection and Testing Laboratory Services.
B. Except as noted below, all inspection and testing related to concrete placement, including reinforcing and embedded items, shall be the responsibility of the Owner. The Owner will directly engage the services of a qualified Testing and Inspection Laboratory, however, the Contractor shall provide access to the Owner's consultant, and, if required, the Contractor shall provide patching and repairing of surfaces removed to facilitate testing and inspection.
C. Should the strength of concrete fall below the minimum, then additional tests, including load tests, may be required. These tests, if required, shall be made at the Contractor's expense and shall be in accordance with ASTM C42 and ACI 318. If tests do not meet the applicable requirements, then the structure, or any part of the structure, shall be removed and replaced at the Contractor's expense.
D. Any concrete testing requested by the Contractor for early formwork or shoring removal, etc., shall be at the Contractor's expense.
E. Do not permit placement of concrete having a measured slump outside limits given on Drawings or Specifications, except when approved by Architect/Engineer.

3.3 PLACING CONCRETE

A. Place concrete in reasonably uniform layers, approximately horizontal, and not more than 18 inches deep, exercising care to avoid vertical joints or inclined planes. The piling up of concrete in the forms in such

a manner as to cause the separation or loss of any of its ingredients will not be permitted. Concrete which has partially set or hardened shall not, under any circumstances, be deposited in the work. All slabs shall be placed for full thickness in one operation without change in proportions, screeded to proper elevation, and floated. Dusting of surfaces with cement is prohibited.

B. Place concrete in the forms as nearly in its final position as is practical to avoid re-handling. Exercise special care to prevent splashing the forms or reinforcement with concrete. Remove any hardened or partially hardened concrete which has accumulated on the forms or reinforcement before the work proceeds. Do not place concrete on previously deposited concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the respective member of section, except as hereinafter specified.

C. Do not permit concrete to drop freely any distance greater than five (5) feet. Where longer drops are necessary, use a chute, tremie, or other acceptable conveyance to assist the concrete into place without separation. Do not pour directly into any excavations where water is standing.

D. Vibration: As soon as concrete is deposited, thoroughly agitate same by means of mechanical vibrators and suitable hand tools, so manipulated as to work the mixture well into all parts and corners of the forms, and entirely around the reinforcement and inserts. Mechanical vibrators shall maintain frequencies in accordance with the recommendations of ACI 309. Table 5.1.4, and shall be operated by competent workmen. Over vibrating and use of vibrators to transport concrete within forms shall not be allowed. A spare vibrator shall be kept on the job site during all concrete placing operations.

E. Bonding: Before depositing any new concrete on or against previously deposited concrete which has partially or entirely set, the surface of the latter shall be thoroughly roughened and cleaned of all foreign matter, scum and laitance. The specified or an Architect/Engineer approved bonding agent or epoxy adhesive shall be used.

F. Construction Joints: Except as otherwise specifically indicated on the Drawings, each concrete member shall be considered as a single unit of operation, and all concrete for the same shall be placed continuously in order that such unit will be monolithic in construction. Should construction joints prove to be absolutely unavoidable, same shall be located at or near the midpoints of spans. Additional construction joints shall not be made under any circumstances without prior review by the Architect/Engineer.

G. Protect all freshly placed concrete from washing by rain, flowing water, etc. Do not allow the concrete to dry out from the time it is deposited in the forms until the expiration of the curing period.

H. Imperfect or damaged work or any material damaged or determined to be defective before final completion and acceptance of the entire job, shall be satisfactorily replaced at the Contractor's expense and shall be in conformity with all of the requirements of the Contract Documents. Removal and replacement of concrete work shall be done in such a manner as not to impair the appearance or strength of the structure in any way.

I. Cleaning: Upon completion of the work, all forms, equipment, protective coverings and any rubbish resulting therefrom shall be removed from the premises. Finished concrete surfaces shall be left in clean and perfect condition, satisfactory to the Owner. Sweep with an ordinary broom and remove all mortar, concrete droppings, loose dirt, mud, etc.

3.4 FLOOR AND SLAB FINISHES

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.
   1. After placing slabs, surface shall be leveled to an F_F 15 - F_L 13 tolerance. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms or rakes.

B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, or sand-bed terrazzo, and as otherwise indicated.
   1. After screening, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture. Surface shall achieve an F_F 20 - F_L 17 tolerance.

C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.
   1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by

final troweling operation, free of trowel marks, uniform in texture and appearance and to a F_F35/ F_L30 tolerance (F_L17 for elevated slabs). Grind smooth surface defects, which would telegraph through applied floor covering system.

D. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect/Engineer before application. A sample panel is required.

E. Liquid Densifier/Sealer: Apply liquid densifier/sealer on exposed interior floors subject to vehicular abrasion and as indicated on the Drawings. Compound shall be mechanically scrubbed into the surface in strict accordance with the directions of the manufacturer and just prior to completion of construction.

3.5 NON-SHRINK GROUT

A. Refer to Structural Drawings for column base plates and other structural grouting requirements.

B. Non-shrink grout shall be mixed only in such quantities as are needed for immediate use. No retempering shall be permitted and materials which have been mixed for a period exceeding 30 minutes shall in no case be used upon any portion of the work.

C. Where high fluidity and/or increased placing time is required use the specified high flow grout. This grout shall be used for all base plates larger than ten (10) square feet.

D. For every 1/3 cubic yards of grout placed, grout strength shall be tested with a set of cubes as follows:
   1. A set of cubes shall consist of three cubes to be tested seven (7) days, and three (3) cubes to be tested at twenty-eight (28) days.
   2. Test cubes shall be made and tested in accordance with ASTM C1107, Section 12.5, with the exception that the grout should be restrained from expansion by a top plate.

3.6 CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. All concrete shall be kept continuously moist and above 50 degrees F for seven days. When high early strength concrete is used this temperature requirement may be lowered to three (3) days.

B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.
   1. Provide specified curing compound to exposed interior slabs. This curing compound must be dissipating or easily removed in the cleaning process prior to the application of any liquid densifier/ sealer.

3.7 DEFECTIVE WORK

A. Imperfect or damaged work, or any material damaged or determined to be defective before final completion and acceptance of the entire job, shall be satisfactorily replaced at the Contractor's expense and shall be in conformity with all of the requirements of the Contract Documents. Removal and replacement of concrete work shall be done in such a manner as not to impair the appearance or strength of the structure in any way.

3.8 CLEANING

A. Upon completion of the work, all forms, equipment, protective coverings and any rubbish resulting there from, shall be removed from the premises. Finished concrete surfaces shall be left in clean and perfect condition, satisfactory to the Owner. Sweep with an ordinary broom and remove all mortar, concrete droppings, loose dirt, mud, etc.

3.9 REPAIR OF DEFECTIVE AREAS

A. With prior approval of the Architect/Engineer, as to method and procedure, all repairs of defective areas shall conform to ACI 301, Section 5.3.7, using the polymer repair mortars and/or epoxy adhesives furnished by The Euclid Chemical Company, Sika Chemical Corp., or Architect/Engineer approved equal.

3.10 FIELD QUALITY CONTROL AND TESTING

A. An Independent Testing Agency will perform Inspection and Testing.

END OF SECTION

SECTION 033900 – CONCRETE CURING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Initial and final curing of horizontal and vertical concrete surfaces.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast in Place Concrete

1.3 REFERENCE STANDARDS

A. ACI 301 – Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005
B. ACI 302.1R – Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (Errata 2007)
C. C. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001 (Reapproved 2008)
D. D. ASTM C 171 – Standard Specification for Sheet Materials for Curing Concrete; 2007.
E. E. ASTM C 309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2007.

1.4 SUBMITTALS

A. See Section – Administrative Requirements, for submittal procedures.
B. Product Data: Provide date on curing compounds and moisture-retaining sheet, including compatibility of different products and limitations.

1.5 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 302 1 R.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver curing materials in manufacturer's sealed packaging, including application instructions.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Membrane Curing Compound: ASTM C 309 Type 1 – Clear or translucent, Class A
B. Moisture-Retaining Sheet: ASTM C 171

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to be cured.

3.2 EXECUTION - HORIZONTAL SURFACES

A. Cure floor surfaces in accordance with ACI 308 R.

3.3 EXECUTION – VERTICAL SURFACES

A. Cure surfaces in accordance with ACI 308R.

3.4 PROTECTION

A. Do not permit traffic over unprotected floor surface.

END OF SECTION

SECTION 040511 – MASONRY MORTARING AND GROUTING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Mortar for masonry.
B. Grout for masonry.

1.2 RELATED REQUIREMENTS

A. Section 04 20 00 - Masonry Unit: Installation of mortar and grout
B. Section 04 27 31 – Reinforced Unit Masonry: Installation of mortar and grout.

1.3 REFERENCE STANDARDS

A. ASTM C 91 – Standard Specification for Masonry Cement; 2005.
B. ASTM C 94/C 94M – Standard Specification for Ready-Mixed Concrete; 2007.
C. ASTM C 144 – Standard Specification for Aggregate for Masonry Mortar; 2004.
D. ASTM C 270 – Standard Specification for Mortar for Unit Masonry; 2007a.
E. ASTM C 404 – Standard Specification for Aggregates for Masonry Grout; 2007.
F. ASTM C 476 – Standard Specification for Grout for Masonry; 2008.
G. ASTM C 780 – Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2008a.
H. ASTM C 979 – Standard Specification for Pigments for Integrally Colored Concrete; 2005.
I. ASTM C 1019 – Standard Test Method for Sampling and Testing Grout; 2008.
J. ASTM C 1072 – Standard Test Method for Measurement of Masonry Flexural Bond Strength; 2006.
K. ASTM C 1314 – Standard Test Method for Compressive Strength of Masonry Prisms; 2007.
L. ASTM E 518 – Standard Test Methods for Flexural Bond Strength of Masonry; 2003.
M. IMIAWC (HW) – Recommended Practices and Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

1.4 SUBMITTALS

A. See Section – Administrative Requirements, for submittal procedures.

1.5 QUALITY ASSURANCE

A. Where standards or requirements of this Section are in conflict with those noted on the Contract Drawings, or the Building Code, the more stringent requirements shall govern. Bring all conflicts and discrepancies to the attention of the Engineer and do not start work until such conflicts and discrepancies are clarified and corrected. Failure to do so will not relieve the Contractor from performing the work correctly at no additional expense to the Owner.
B. Testing Laboratory Services:
    1. Test results shall meet or exceed established standards. A technician from the Owner's Testing Laboratory must be present during all operations.

1.6 FIELD CONDITIONS

A. Cold Weather Requirements: Comply with recommendations of IMIAWC (CW).
B. Hot Weather Requirements: Comply with IMIAWC (HW).

PART 2 – PRODUCTS

2.1 MATERIALS

A. Masonry Cement: ASTM C 91, type as scheduled in this section.
    1. Colored Mortar: Premixed cement as selected by Engineer.
B. Mortar Aggregate: ASTM C 144.
C. Grout Aggregate: ASTM C 404.
D. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C 979.
    1. Color(s): As selected by Engineer from manufacturer's full range.
E. Water: Clean and potable.

2.2 MORTAR MIXES

A. Mortar for Unit Masonry: ASTM C 270, Property Specification.
    1. Exterior, loadbearing masonry: Type S
    2. Exterior, non-loadbearing masonry: Type S
    3. Interior, loadbearing masonry: Type S

4. Interior, non-loadbearing masonry: Type N
5. Glass unit masonry: Type S

B. Colored Mortar: Proportion selected pigments and other ingredients ad selected by the Engineer, without exceeding manufacturer's recommended pigment-to-cement ratio.

2.3 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C 270 and in quantities needed for immediate use.
B. Maintain sand uniformly damp immediately before the mixing process.
C. Add mortar color in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.
D. Do not use anti-freeze compounds to lower the freezing point of mortar.
E. If water is lost by evaporation, re-temper only within two hours of mixing.
F. Use mortar within two hours after mixing at temperatures of 90 degrees F, or two-and-one-half hours at temperatures under 40 degrees F.

2.4 GROUT MIXES

A. Bond Beams and Lintels: 3,000 psi strength at 28 days; 8-10 inch slump; provide premised type in accordance with ASTM C 94/ C 94M.
    1. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
    2. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.5 GROUT MIXING

A. Mix grout in accordance with ASTM C 94/C 94M
B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C 476 for fine and coarse grout.

2.6 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent testing agency.
B. Mortar Mixes: Test mortars pre-batched by weight in accordance with ASTM C 780 recommendations for preconstruction testing.
    1. Test results will be used to establish optimum mortar proportions and establish quality control values for construction testing.
C. Grout Mixes: Test grout batches in accordance with ASTM C 1019

procedures.

1. Test results will be used to establish optimum grout proportions and establish quality control values for construction testing.

PART 3 – EXECUTION

3.1 PREPARATION

A. Plug clean-out holes for grouted masonry with brick masonry units. Brace masonry to resist wet grout pressure.

3.2 INSTALLATION

A. Install mortar and grout to requirements of section(s) in which masonry is specified.
B. Work grout into masonry cores and cavities to eliminate voids.
C. Do not install grout in lifts greater than 38 inches without consolidating grout by rodding.
D. Do not displace reinforcement while placing grout.
E. Remove excess mortar from grout spaces.

3.3 GROUTING

A. Perform grouting by means of high-lift technique, except in locations that mandate use of low-lift grouting technique.
B. Low-Lift Grouting:
    1. Limit height of pours to 12 inches.
    2. Limit height of masonry to 16 inches above each pour.
    3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
    4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.
C. High-Lift Grouting:
    1. Verify that horizontal and vertical reinforcement is in proper position and adequately secured before beginning pours.
    2. Hollow Masonry: Limit lifts to maximum 8 feet and pours to maximum height of 8 feet.
    3. Place grout for spanning elements in single, continuous pour.

3.4 FIELD QUALITY CONTROL

A. An independent testing agency will perform field tests.

B. Test and evaluate mortar in accordance with ASTM C 780 procedures.
    1. Test with same frequency as specified for masonry units.
C. Test and evaluate grout in accordance with ASTM C 1019 procedures.
    1. Test with same frequency as specified for masonry units.
D. Prism Test: Test masonry and mortar panels for compressive strength in accordance with ASTM C 1314, and for flexural bond strength in accordance with ASTM C 1072 or ASTM E 518; perform tests and evaluate results as specified individual masonry sections.

END OF SECTION

SECTION 042613 – MASONRY VENEER

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Clay face brick.
   2. Decorative concrete masonry units.
   3. Mortar.
   4. Ties and anchors.
   5. Embedded flashing.
   6. Miscellaneous masonry accessories.

B. Products installed but not Furnished under this Section:
   1. Steel lintels and masonry veneer.
   2. Steel shelf angles for supporting masonry veneer.

C. Related Requirements:
   1. Section 07 62 00 “Sheet Metal Flashing and Trim” for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 DEFINITIONS

A. CMU’s: Concrete Masonry Unit(s).

1.4 PREINSTALLTION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Indigenous Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.

C. Shop Drawings: For the following:
   1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
   3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

D. Sample for Initial Selection:
   1. Clay face brick, in the form of straps of five or more bricks.
   2. Decorative CMU's, in the form of small-scale units.
   3. Concrete face brick, in the form of small-scale units.
   4. Stone trim.
   5. Colored Mortar.
   6. Weep holes/vents.

E. Samples for Verification: For each type and color of the following:
   1. Clay face brick, in the form of straps of five or more bricks.
   2. Special brick shapes.
   3. Decorative CMU's.
   4. Concrete face brick.
   5. Stone trim.
   6. Pigmented and colored-aggregate mortar. Make samples using same sand and mortar ingredients to be used on Project.
   7. Weep holes and vents.
   8. Accessories embedded in masonry.

1.6 INFORMATIONAL SUBMITTALS

A. List of materials used in construction mockups: List generic product names together with manufacturers, manufacturer's product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
   1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such

deviations are specifically brought to the attention of the Engineer and approved in writing.

B. Material Certificates: For each type and size of the following:
   1. Masonry units.
      a. Include material test reports substantiating compliance with requirements.
      b. For brick, include size-variation data verifying that actual range of sizes falls within the specified tolerances.
      c. For exposed brick, include test report for efflorescence according to ASTM C 67.
      d. For surface-coated brick, include test report for durability of surface appearance after 50 cycles of freezing and thawing according to ASTM C 67 or a list of addresses of buildings in Project's area where proposed brick has been used successfully and with a history of durability.
   2. Integral water repellant used in decorative CMUs.
   3. Cementitious materials. Include name of manufacturer, brand name and type.
   4. Mortar admixtures.
   5. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
   6. Anchors, ties, and metal accessories.

C. Mix Design: For each type of mortar. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/ C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.

D. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 01 40 00 "Quality Requirements" for mockups.

   1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 60 inches long by 38 inches high by full thickness.

2. Build sample panels facing south.
3. Where masonry is to match existing, build panels adjacent and parallel to existing surface.
4. Clean exposed faces of panels with masonry cleaner indicated.
5. Protect approved sample panels from the elements with weather-resistant membrane.
6. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Engineer in writing.
    a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Engineer in writing.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for material and execution.
1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for each type of exposed unit masonry construction in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup wythes and accessories.
    a. Include a sealant-filled joint as least 16 inches long in each mockup.
    b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
    c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
    d. Include water-resistive/air barrier, veneer anchors, flashing, and weep holes in exterior masonry-veneer wall mockup.
3. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
4. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
5. Protect accepted mockups from the elements with weather-resistant membrane.
6. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

a. Approval of mockups is also for other material and construction qualities specifically approved by Engineer in writing.
b. Approval of mockups does not constitute approval of deviations from Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.

7. Subject to compliance with requirement, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet. Do not install until they are dry.

B. Store cementitious material on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing soils.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of veneer, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
1. Extend cover a minimum of 24 inches down face of veneer, and hold cover securely in place.

B. Stain Prevention: Prevent grout, mortar, and soil form staining the face of masonry. Immediately remove grout, mortar, and soil that come in contact with masonry.
1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.

2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto complete masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 degrees F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects will be

exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

2.3 BRICK

A. Indigenous Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.

B. General: Provide Shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
   1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
   2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels
   3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
   4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

C. Clay Face Brick: Facing brick complying with ASTM C 216 or hollow brick complying with ASTM C 652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area).
   1. ACME BRICK
   2. Grade: SW
   3. Type: FBS
   4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C 67.
   5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
   6. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing according to ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet or shall have a history of successful use in Project's area.

7. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-1/2 inches long or 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
8. Application: Use where brick is exposed unless otherwise indicated.
9. Color and Texture: Steele Gray, velour.

2.4 CONCRETE MASONRY UNITS

A. Indigenous Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.

B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

C. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.
   1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514/E 514M as wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
      a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
         1) ACM Chemistries.
         2) BASF Corporation; Construction Systems.
         3) Grace Construction Products; W.R. Grace & Co. – Conn.

D. Decorative CMUs: ASTM C 90.
   1. Manufacturers: Subject compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Headwaters Construction Materials, 2233 Ackerman Road, San Antonio, Texas 78219, (210) 666-4989

2. Density Classification: Medium weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Pattern and Texture:
   a. Standard pattern, smooth-faced finish; as indicated on drawings.
   b. Scored vertically so units laid in running bond paper appear as square units laid in staked bond, standard finish; as indicated in drawings.
   c. Triple scored vertically so units laid in running bond appear as vertical units laid in stacked bond (soldier courses), standard finish; as indicated on drawings.
   d. Special shapes, smooth-face finish; as indicated on drawings.
   e. Special Blocks: Screen Block, standard finish; as indicated on drawings.
5. Colors: As indicated on drawings.

2.5 MORTAR MATERIALS

A. Indigenous Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.

B. Portland Cement: ASTM C 150/ C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
   1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.

C. Hydrated Lime: ASTM C 207, Type N.

D. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.

E. Masonry Cement: ASTM C 91/C 91M.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Cemex S.A.B. de C.V.
      b. Lafarge North America, Inc.
      c. Lehigh Hanson: Heidelberg Cement Group.

F. Mortar Cement: ASTM C 1329/C 1329M.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Lafarge North America, Inc.

G. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979 M. Use only pigments with a record of satisfactory performance in masonry mortar.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Davis Colors.
      b. Solomon Colors, Inc.

H. Colored Cement Products: Packaged blend made from Portland cement and hydrated lime. Masonry cement or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
   1. Colored Portland Cement-Lime Mix:
      a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
         1) Holcin (US), Inc.
         2) Lafarge North America, Inc.
         3) Lehigh Hanson; Heidelberg Cement Group.
   2. Colored Masonry Cement:
      a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
         1) Cemex S.A.B. de C.V.
         2) Holcin (US), Inc.
         3) Lafarge North America, Inc.
         4) Lehigh Hanson; Heidelberg Cement Group.
   3. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
   4. Pigments shall not exceed 10 percent of Portland cement by weight.
   5. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.

I. Aggregate for Mortar: ASTM C 144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than ¼ inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
   3. White-Mortar Aggregates: Natural white sand or crushed white stone.
   4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

J. Cold-weather admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include but are not limited to the following:
      a. ACM Chemistries.
      b. BASF Corporation – Admixture Systems.
      c. Grace Construction Products; W.R. Grace & Co. – Conn.

K. Water- Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMU's containing integral water repellent from same manufacturer.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. ACM Chemistries.
      b. BASF Corporation – Admixture Systems.
      c. Grace Construction Products; W.R. Grace & Co. – Conn.

L. Water: Potable.

2.6 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
   1. Hot-Dipped Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.

2. Galvanized-Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel with ASTM A 153/A 153M, Class B coating.

C. Corrugated-Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.6 to 0.10 inch made from 0.030-inch steel sheet, galvanized after fabrication.

D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped ¼-inch diameter, hot-dip galvanized steel wire.
2. Tie Section: Triangular-shaped wire tie made from 0.187-inch diameter, hot-dip galvanized steel wire.

E. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch thick, steel sheet, galvanized after fabrication.
   a. 0.064-inch thick, galvanized-steel sheet may be used at interior walls unless otherwise indicated.
2. Tie Section: Triangular-shaped wire tie made from 0.187-inch diameter, hot-dip galvanized steel wire.
3. Corrugated-Metal Ties: Metal strips not less than 7/8-inch wide corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.060-inch thick steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete.
   a. 0.064-inch thick, galvanized sheet may be used at interior walls unless otherwise indicated.

F. Adjustable Masonry-Veneer Anchors:
1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch-thick steel sheet, galvanized after fabrication.

3. Fabricate wire ties from 0.187-inch-diameter, hot-dip galvanized-steel wire unless otherwise indicated.
4. Fabricate wire connector sections from 0.187-inch-diameter, hot-dip galvanized, carbon steel wire.
5. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry veneer anchors specified.
   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      1) FERO Corporation.
      2) Hohmann & Barnard, Inc.
6. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with a projecting tab having a slotted hole for inserting wire tie.
   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      1) FERO Corporation.
      2) Hohmann & Barnard, Inc.
7. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having holes for inserting vertical legs of wire tie formed to fit anchor section.
   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      1) Heckmann Building Products, Inc.
      2) Hohmann & Barnard, Inc.
      3) Wire-Bond.
8. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a sheet metal anchor section, 1-1/4 inches wide by 9 inches long, with screw holes top and bottom and with raised rib-stiffened strap, 5/8 inch wide by 5-1/2 inches long, stamped into center to provide a slot between strap and base for inserting wire tie.
   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      1) Hohmann & Barnard, Inc.

9. Screw-Attached, Masonry-Veneer Anchors: Wire tie and sheet metal anchor section, 1-1/4 inches wide by 6 inches long, with screw holes top and bottom and with raised rib-stiffened strap, 5/8 inch wide by 3-5/8 inches long, stamped into center to provide a slot between strap and base for inserting wire tie.
    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
        1) Heckmann Building Products, Inc.
        2) Hohmann & Barnard, Inc.
        3) Wire-Bond.
10. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a gasketed sheet metal anchor section, 1-1/4 inches wide by 6 inches long, with screw holes top and bottom; top and bottom ends bent to form pronged legs of length to match thickness of insulation or sheathing; and raised rib-stiffened strap, 5/8 inch wide by 6 inches long, stamped into center to provide a slot between strap and base for inserting wire tie. Self-adhering, modified bituminous gasket fits behind anchor plate and extends beyond pronged legs.
    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
        1) Hohmann & Barnard, Inc.
        2) Wire-Bond.
11. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a corrosion-resistant, self-drilling, eye-screw designed to receive wire tie. Eye-screw has spacer that seats directly against framing and is same thickness as sheathing and has gasketed washer head that covers hole in sheathing.
    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
        1) Heckmann Building Products, Inc.
        2) Hohmann & Barnard, Inc.
        3) Wire-Bond.
12. Seismic Masonry-Veneer Anchors: Connector section and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having slotted holes for inserting vertical leg of connector section. Connector section consists of a rib-stiffened, sheet metal bent plate with down-turned leg designed

to fit in anchor section slot and with integral tabs designed to engage continuous wire.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1) Dur-O-Wal; a Hohmann & Barnard company.
   2) Hohmann & Barnard, Inc.
   3) Wire-Bond.

13. Seismic Masonry-Veneer Anchors: Wire tie and rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having holes for inserting vertical legs of wire tie. Wire tie has sheet metal clip welded to it with integral tabs designed to engage continuous wire.
    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
       1) Hohmann & Barnard, Inc.
       2) Wire-Bond.
14. Seismic Masonry-Veneer Anchors: Connector section and a gasket sheet metal anchor section, 1-1/4 inches wide by 6 inches long, with screw holes top and bottom; top and bottom ends bent to form pronged legs of length to match thickness of insulation or sheathing; and raised rib-stiffened strap, 5/8 inch wide by 6 inches long, tamped into center to provide a shlot between strap and base or inserting connector section. Self-adhering, modified bituminous gasket fits behind anchor plate and extends beyond pronged legs. Connector section consists of a triangular wire tie and rigid PVC extrusion with snap-in grooves for inserting continuous wire.
    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
       1) Hohmann & Barnard, Inc.
15. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours according to ASTM B 117.
16. Stainless-Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud

flange with not less than three exposed threads; either made from Type 410 stainless steel or made with a carbon-steel drill point and 300 Series stainless steel shank.

2.7 EMBEDDED FLASHING MATERIALS

A. Flexible Flashing: Use one of the following unless otherwise indicated:
   1. Cooper-Laminated Flashing: 5 oz./sq. ft. copper sheet bonded between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Hohmann & Barnard, Inc.
         2) STS Coatings, Inc.; Gorilla Flash VF-1000
         3) York Manufacturing, Inc.; York Flash-Vent

B. Application: Unless otherwise indicated, use the following:
   1. Where flashing is indicated to receive counterflashing, use metal flashing.
   2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.

C. Solder and Sealants for Sheet Metal Flashings: As specified in Section 07 62 00 "Sheet Metal Flashing and Trim."
   1. Elastomeric Sealant: ASTM C 920, chemically curing polyether sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

E. Termination Bars for Flexible Flashing: Aluminum sheet 0.064 inch by 1-1/2 inches with a 3/8 inch sealant flange at top.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.
B. Weep/Vent Products: Use the following unless otherwise indicated:
   1. Mesh Weep/Vent: Free-draining mesh; made form polyethylene strands, full height and width of head joint and depth 1/8 inch less

than depth of outer width; in color selected from manufacturer's standard.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering such products that may be incorporated into the Work include, but are not limited to the following:
   1) CavClear/Archovations, Inc.
   2) Mortar Net Solutions.

C. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated in the Work include, but are not limited to the following:
      a. CavClear/Archovations, Inc.
      b. Hohmann & Barnard, Inc.
      c. Mortar Net Solutions.
      d. Wire-Bond
   2. Configuration: Provide one of the following:
      a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.

2.9 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer or masonry units being cleaned.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Deidrich Technologies, Inc.; a division of Sandell Construction Solutions.
      b. EaCo Chem, Inc.
      c. PROSOCO, Inc.

2.10 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar or gout.

2. Use masonry cement mortar unless otherwise indicated.
3. For exterior masonry, use masonry cement mortar.
4. For reinforced masonry, use masonry cement mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Use Type N unless another type is indicated.
1. For masonry below grade on in contact with earth, use Type S.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
1. Pigments shall not exceed 10 percent of Portland cement by weight.
2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
3. Mix to match Engineer's sample.
4. Application: Use pigmented mortar for exposed mortar joints.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
1. Mix to match Engineer's sample.
2. Application: Use colored aggregate mortar for exposed mortar joints.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

D. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

E. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation, do not vary by more than plus ½ inch or minus ¼ inch.
   2. For location of elements in plan, do not vary from that indicated by more than plus or minus ½ inch.
   3. For location of elements in elevation, do not vary from that indicated by more than plus or minus ¼ inch in a story height or ½ inch total.

B. Lines and Levels:
   1. For bed joints and top surfaces of bearing walls, do not vary form level by more than ¼ inch or 10 feet, or ½ inch maximum in 40 feet.
   2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, ¼ inch in 20 feet, or ½ inch maximum in 40 feet.

3. For vertical lines and surfaces, do not vary from plumb by more than ¼ inch in 10 feet 3/8 inch in 20 feet, or ½ inch maximum in 40 feet.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, ¼ inch in 20 feet, or ½ inch maximum in 40 feet.
5. For lines and surfaces, do not vary from straight by more than ¼ inch in 10 feet, 3/8 inch in 20 feet, or ½ inch maximum in 40 feet.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than ¼ inch in 10 feet, or ½ inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage or masonry units within tolerances specified for warpage of units.

C. Joints:
1. For bed joints, do not vary form thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to ½ inch.
2. For exposed bed joints, do not vary form bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary form thickness indicated by more than plus 3/8 inch or minus ¼ inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thickness and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, aly exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay masonry unit with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

B. Lay hollow brick and CMU's with face shell fully bedded in mortar and with head joints of depth equal to bed joints. At starting course, fully bed entire units, including area under cells.
   1. At anchors and ties, fully bed units and fill cells with mortar as needed to fully embed anchors and ties in mortar.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
   1. For glazed masonry units, use a nonmetallic jointer ¾ inch or more in width.

3.6 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing and concrete and masonry backup with seismic masonry-veneer anchors to comply with the following requirements:
   1. Fasten screw-attached and seismic anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design uses one fastener.
   2. Embed tie sections, connector section and continuous wire in masonry joints.
   3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
   4. Space anchors as indicated, but not more than 18 inches o.c. vertically and 24 inches o.c. horizontally, with not less than one anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.
   5. Space anchors as indicated, but not more than 16 inches o.c. vertically and 25 inches o.c. horizontally, with not less than one anchor for each 2.67 sq. ft. of wall area. Install additional anchors

within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

6. Space anchors as indicated, but not more than 18 inches o.c. vertically and horizontally. Install additional anchors within 12 inches of openings and at intervals, not exceeding 24 inches, around perimeter.

B. Provide not less than 2 inches of airspace between back of masonry veneer and face of insulation.
   1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts and faces structural steel or concrete to comply with the following:
   1. Provide an open space not less than 1 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
   2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 EXPANSION JOINTS

A. General: Install expansion-joint materials in unit masonry progresses. Do not allow materials to span expansion joints without provision to allow fir in-plane wall or partition movement.

B. Form expansion joints as follows:
   1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade at junctures with horizontal expansion joints if any.
   2. Build flanges of factory-fabricated, expansion-joint units into masonry.
   3. Build in compressible joint fillers where indicated.
   4. Form open joint full depth of brick withe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 07 92 00 “Joint Sealants.”

C. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for

installing sealant and backer rod specified in Section 07 92 00 “Joint Sealants,” but not less than 3/8 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.9 LINTELS

A. Install steel lintels where indicated (galvanized-dipped).

B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.10 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstruction to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstruction to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:
   1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
   2. Extend flashing though veneer, across airspace behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under water-resistive barrier, lapping at least 4 inches.
   3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
   4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 07 92 00 “Joint Sealants” for application indicated.
   5. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 07 92 00 “Joint Sealants” for application indicated.

6. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing ½ inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
7. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing ½ inch back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.
8. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes in veneers in head joints of first course of masonry immediately above embedded flashing.
1. Use specified weep/vent products to form weep holes.
2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
3. Space weep holes 24 inches o.c. unless otherwise indicated.
4. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
5. Trim wicking material flush with outside face of wall after mortar has set.

E. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

F. Install vents in head joints in interior wythes at spacing indicated. Use specified weep/vent products or open-head joints to form vents.
1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
   1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

C. Testing Prior to Construction: One set of tests.

D. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.

E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

3.12 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Engineer's

approval of sample cleaning before proceeding with cleaning of masonry.

3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners: remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean stone trim to comply with stone supplier's written instructions.
8. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.13 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as it is placed.
   1. Crush masonry waste to less than 4 inches in each dimension.
   2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 31 20 00 "Earth Moving."
   3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

SECTION 042731 – REINFORCED UNIT MASONRY

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Concrete Block.
B. Mortar and Grout.
C. Reinforcement and Anchorage.
D. Flashing.
E. Lintels
F. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 04 05 11 – Masonry Mortaring and Grouting
B. Section 05 50 00 – Metal Fabrications: Loose steel lintels
C. Section – Rough Carpentry: Nailing strips built into masonry.
D. Section – Wood Blocking and Curbing: Nailing strips built into masonry.
E. Section – Joint Sealers and Sealants: Backing rod and sealant at control and expansion joints.
F. Section – 04 20 00 – Unit Masonry: Commercial and Structural Block.

1.3 REFERENCE STANDARDS

A. ACI 530/ASCE 5/TMS 402 – Building Code Requirements for Masonry Structures; American Concrete Institute International; 2008.
B. ACI 530.1/ASCE 6/TMS 602 – Specification for Masonry Structures; American Concrete Institute International; 2008.
C. ASTM A82/A82M – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.
D. ASTM A 653/A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009.
E. ASTM C 91 – Standard Specification for Masonry Cement; 2005.
F. ASTM C 270 – Standard Specification for Mortar for Unit Masonry; 2007a.
G. ASTM C 476 – Standard Specification for Grout for Masonry; 2008.

1.4 SUBMITTALS

A. See Section – Administrative Requirements, for submittal procedures.

1.5 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/ TMS 602, except where exceeded by requirements of the contract documents.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry unit by means that will prevent mechanical damage and contamination by other materials.

PART 2 – PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with reference standard and as follows:
   1. Size: Standards Units with nominal face dimensions of 16 x 8 inches and nominal depths as indicated on the drawings for specific locations.
   2. Special Shapes: Provide non-standard blocks configured for corners.

2.2 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 05 11 – Mortaring and Grouting.

2.3 REINFORCEMENT AND ANCHORAGE

A. Manufacturers of Joint Reinforcement and Anchors:
   1. Dur-O-Wal: www.dur-o-wal.com.
   2. Hohman & Barnard, Inc.: www.h-b.com.
   3. Masonry Reinforcing Corporation of America: www.wirebond.com
   4. Substitutions: See Section – Product Requirements.

2.4 FLASHINGS

A. Metal Flashing Materials: Per Engineering Specs.

2.5 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

2.6 LINTELS

2.7 PRECONSTRUCTION TESTING

A. An Independent Testing Agency will perform Inspection and Testing.

PART 3 – EXAMINATION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Clean reinforcement of loose rust.

C. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COURSING

A. Establish lines, levels, ad coursing indicated. Protect form displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units.

3.4 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar as work progresses.

E. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.5 REINFORCEMENT AND ANCHORAGE

A. Reinforcement Bars: Secure at locations indicated and to avoid displacement during grouting. Minimum spacing between bars or to masonry surfaces shall be one bar diameter.

B. Wall Ties: Install wall ties at locations indicated, spaced at not more than 24 inches on center horizontally and 16 inches on center vertically, unless otherwise indicated on drawings.

C. Reinforced Hollow Unit Masonry: Keep vertical cores to be grouted clear of mortar, including bed area of first course.
   1. Bond Beams: At bond beams or other locations for horizontally reinforced masonry, provide special masonry unit or saw to accommodate reinforcement.

3.6 MASONRY FLASHING

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashing full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashing.

3.7 GROUTING

A. Use either high-lift or low-lift grouting techniques, that's option, subject to other limitations of contract documents.

B. Low-Lift Grouting:
   1. Limit height of pours to 12 inches.
   2. Limit height of masonry to 16 inches above each pour.

3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

C. High-Lift Grouting:
1. Verify that horizontal and vertical reinforcement is in proper position and adequately secure before beginning pours.
2. Place grout for spanning elements in single, continuous pour.

3.8 CONTROL AND EXPANSION JOINTS

A. Install preformed joint devices in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.9 TOLERANCES

A. Maximum Variation from Plumb: ¼ inch per story non-cumulative; ½ inch in two stories or more.

B. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

C. Maximum Variation from Cross Sectional Thickness of Walls: ¼ inch.

3.10 CLEANING

A. Remove excess mortar and mortar smears as work progresses.

B. Use non-metallic tools in cleaning operations.

3.11 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 12 00 – STRUCTURAL STEEL

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Labor, materials, services, equipment, and appliances required in connection with or incidental to furnishing, fabricating, delivering, and erecting structural steel complete, as described in this Section, shown on Drawings, or reasonably implied therefrom, including, but not limited to:
   1. Structural steel columns, girders, beams, and angles.
   2. Angle frames for openings in floors and roofs.
   3. Steel plates and miscellaneous deck support angles.
   4. Connections and component parts.
   5. Qualification of welders employed on the Project.
   6. Galvanizing of items.
   7. Shop prime coat painting and field touch-up painting.
   8. Grouting of base plates.
   9. Temporary bracing of construction.
   10. Fabrication/erection inspection and testing.

B. Extend of structural steel work is shown on the Structural Drawings, including schedules, notes and details to show sizes and locations of members, typical connections and types of steel required.

C. Include all supplementary parts and members necessary to complete the structural steel work, regarless of whether such parts and members are definitely shown or specified, and furnish all such gussets, plates, bolts, nuts, washers, welds, etc., as may be required for the proper assembly of all items. Include miscellaneous deck support angles as required for the proper support of metal floor deck around columns, gussets, openings and obstructions, and proper support of metal roof deck around openings, obstructions, and where required.

1.2 RELATED REQUIREMENTS

A. Section – Testing and Inspecting Services.

1.3 RELATED WORK

A. Section 03 30 00 – Cast-In-Place Concrete: Installation of anchor bolts.
B. Section 04 20 00 – Unit Masonry: Furnishing masonry anchors to be attached to structural steel.
C. Section 05 21 00 – Open Web Steel Joists and Joist Girders.
D. Section 05 31 00 – Steel Deck

E. Section – Light Gauge Steel Framing.
F. Section 05 50 00 – Miscellaneous Metals.
G. Section – Sprayed Fireproofing.
H. Section – Painting and Straining: Finish painting of exposed structural steel.

1.4 REFERENCES

A. American Society for Testing and Materials (ASTM)
1. A6, Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
2. A36, Standard Specification for Carbon Structural Steel.
3. A53, Standard Specification for Pipe, Steel, Black and Holt-Dipped, Zinc-Coated Welded and Seamless.
4. A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
5. A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
6. A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
7. A307, Standard Specification for Carbon Steel Bolts and Studs 6000 psi Tensile.
8. A325, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
9. A490, Standard Specification for Structural Bolts, Steel, Heat Treated, 150 ksi (1035 Mpa) Tensile Strength.
10. A500, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
11. A578, Standard Specification for Straight-Beam Ultrasonic Examination of Plain and Clad Steel Plates for Special Applications.
12. A653, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvanized) by the Hot-Dip Process.
13. A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
14. A897, Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on each surface.
15. A992, Standard Specification for Structural Steel Shapes.

B. American Institute for Steel Construction (AISC)
1. Code of Standard Practice for Steel Buildings and Bridges.
2. Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings, latest edition.

3. Specifications for Structural Joints Using ASTM A325 or A490 Bolts, Approved by the Research Council on Structural Connections of the Engineering Foundation.
4. Specification for Architecturally Exposed Structural Steel.
5. Structural Welding Guide, AWS D1.1.

C. American National Standards Institute (ANSI).
1. Standards
D. American Welding Society (AWS)
1. D1.1 Structural Welding Code.
E. Corps of Engineers (CE)
1. CRD-C 621.
F. Industrial Fasteners Institute(IFI)
1. Handbook on Bolt, Nut, and Rivet Standards.
G. Steel Structures Painting Council (SSPC)
1. Painting Manual, Volume 1, Good Painting Practice
2. Painting Manual, Volume 2, Systems Specifications

1.5. QUALITY ASSURANCE

A. All standards referenced in this Section shall apply, as applicable to the work, unless noted otherwise. In case of conflict between the Contract Documents and a referenced standard, the Contract Documents shall govern. In case of conflict between the Contract Documents and the Building Code, the more stringent requirement shall govern.
B. Contractor shall furnish fabrication/erection inspection and testing of all welds in accordance with AWS D1.1, Chapter 6. Submit records of inspections and tests to Owner's testing laboratory for their review.
C. An Independent Testing Agency will perform Inspection and Testing.
D. All materials, fabrication procedures and field are subject to verification inspection and testing by the Owner's testing laboratory, in both shop and field. Such inspections and tests will not relieve the Contractor of his responsibility for providing materials and fabrication procedures in compliance with specified requirements. Owner reserves the right to use ultrasonic or radiographic inspection to verify the adequacy of all welds. Testing procedures and acceptance criteria shall be as specified in AWS D1.1. Promptly remove and replace materials or fabricated components which do not comply.
E. Qualifications for Welding Work: Contractor shall be responsible for qualifying welding operators employed on the Project in accordance with AWS Standard Qualification Procedure. Provide certification to Owner's testing laboratory that welder's have satisfactorily passed AWS qualification tests in the previous 12 months. Retesting and recertification of welders, if required, is the Contractor's responsibility.

F. Qualifications for Welding Procedures: Contractor shall provide the testing laboratory with welding procedures which are to be used in executing this work. Welding procedures shall be qualified prior to use in accordance with AWS D1.1, Part B.

G. Comply with provisions of referenced codes, specifications, and standards, in addition to the Building Code.

H. Fabricator's Qualifications:

1. Company specializing in the fabrication of structural steel for buildings with minimum of five (5) years' experience and currently certified by AISC or IAS Quality Certification Program.

1.6 DESIGN

A. Connections: Shall be designed in accordance with the requirements on the Structural Drawings.

B. Fabricator shall be responsible for all errors of detailing, fabrications, and for correct fitting of structural steel members.

1.7 SUBMITTALS

A. Product Data: Submit producer's or manufacturer's specifications and installation instructions, including laboratory test reports and other data, to show compliance with Specifications for the following products:

1. Structural steel primer and touch-up paint.
2. Shrinkage-resistant grout.

B. Mill Certificates: Submit manufacturer's mill analysis, for Architect's record, showing compliance with Specifications for the following products:

1. Structural steel (each type)
2. High-strength bolts (each type), including nuts and washers.

C. Shop Drawings:

1. Submit design calculations for the connections designed by the Contractor, prior to or with the shop drawings. Calculations shall bear the seal of a Registered Professional Engineer, licensed in the State of Texas. Shop drawings containing connections for which calculations have not been received will be returned unchecked as an incomplete submittal. Design Calculations will be retained for the Architect's file, and will not be approved or returned. Design calculations shall include the following:

a. All structural steel beam connections not specifically detailed on the Structural Drawings shall be designed by the Contractor, under the direct supervision of a

Registered Professional Engineer, licensed in the State of Texas. Connections shall be designed to resist the forces specified on the Structural Drawings and shall be shown in detail on the shop drawings.

b. Wind Brace Connections: Calculations shall be given for each different wind brace connection used and detailed on the shop drawings. Each connection calculation shall identify the location or locations for which the connection applies by indicating the following:
   1) the wind brace mark(s) from the Structural Drawings;
   2) the piece mark(s) from the shop drawings;
   3) the member size, and
   4) the design loading(s)

2. Submit shop drawings prepared under the supervision of a Registered Professional Engineer, licensed in the State of Texas, including complete details and schedules for fabrication and shop assembly of members, erection plans, details, procedures, and diagrams showing sequence of erection. Include details of cuts, connections, camber holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld. Shop drawings shall not be produced by using reproductions of Contract Documents.
   a. Structural steel members for which shop drawings have not been reviewed shall not be fabricated. Architect's review shall cover general locations, spacings, and details of design. Omission from shop drawings of any materials required by the Contract Documents shall not relieve the Contractor of his responsibility for furnishing and installing such materials, even though such shop drawings may have been reviewed and returned.
   b. Substitutions: Submit substitutions of sections or modifications of details, or both, and the reasons therefore, along with shop drawings for Architect's approval. Submitted substitutions must be clearly identified and noted as such. Approved substitutions, modifications, and necessary changes in related portions of the work shall be coordinated by the fabricator and shall be accomplished at no additional expense to the Owner.

D. Setting Drawings and Templates: Submit setting drawings, templates, and directions for installation of anchor bolts and other anchorages installed by other trades.

E. Certifications:
   1. Submit evidence of current AISC or IAS plant certification. Refer Fabricator's Qualifications under Quality Control.
   2. Submit welder's certification to Owner's testing laboratory. Refer Qualifications for Welding Work under Quality Control.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time so as to not delay that work.

B. Deliver packaged materials in the manufacturer's original unopened packaging, store and handle steel joists in accordance with SJI recommendations. Protect packaged materials from corrosion and deterioration.

C. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms, or other means of support. Protect steel members from corrosion and deterioration.

D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed at no additional expense to Owner.

E. Support cambered members during shipment and handling in a manner which will not result in loss of camber.

1.9 PROJECT CONDITIONS

A. Coordinate erection of structural steel with work of other trades.

B. Do not install columns which have anchor bolts in concrete, until concrete members have attained their 28 day compressive strength.

1.10 PRE-INSTALLATION CONFERENCE

A. Refer to Section – Project Coordination.

PART 2 – PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Specifications are based on the named product(s) and manufacturer(s). Except where specifically stated as no substitutions, other products must be by a manufacturer having a minimum of five (5) years' experience manufacturing product(s) meeting or exceeding the specifications, comply with requirements of this Section, and Division 1 requirements for substitutions in order to be considered.

2.2 MATERIALS (As shown or required)

A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and application of surface finishes.

B. Steel:
   1. Wide Flange (W) Shapes and Tees: ASTM A 992 (50 ksi yield).
   2. Other Rolled Shapes, Plates, and Bars: ASTM A 36 (36 ksi yield).
   3. Cold Formed Steel Tubing: ASTM A 500, Grade B (46,000 psi yield).
   4. Steel Pipe: ASTM A 501, Type E or S, Grade B.

C. Bolts, Nuts, and Washers:
   1. Bolts: Anchor bolts and erection bolts shall conform to ASTM A 307 Grade A, and to the requirements for regular hexagon bolts and nuts of ANSI B18.2.1 and ANSI B18.2.2.
   2. High-strength bolts for connections shall conform to ASTM A 325 or ASTM A 490. Dimensions of bolt heads and nuts shall conform to requirements for heavy hexagon nuts of ANSI B18.2.1 and ANSI B18.2.2.
   3. Washers: Circular washers shall be flat and smooth, shall conform to requirements of Type A washers in ANSI B23.1. Beveled washers for "S" shapes and channels shall be square or rectangular, shall taper in thickness, and shall be smooth. Washers for use with high-strength bolts shall be hardened.
   4. Tension Control Bolts: May, at Contractor's option, be used in lieu of conventional high-strength bolts. Bolts shall be furnished by one (1) of the following:
      a. LeJeune Bolt Company, Lakeville, Minnesota
      b. Lohr Structural Fasteners, Inc., P. O. Box 1387, Humble, Texas.

5. Drilled Anchor Bolts: Shall be one (1) of the following (No substitutions):
    a. Wej-it Bolt, Wej-it Corporation, Tulsa, Oklahoma
    b. Kwik Bolt, Hilti Fastening Systems, Tulsa, Oklahoma
    c. Trubolt, Ramset Fastening Systems, Paris, Kentucky

D. Welding Electrodes: Shall conform to the requirements and specifications of AWS. Use E70 electrodes. For high-strength, low-alloy steel, provide electrodes, welding rods, and filler metals equal in strength and compatible in appearance with parent metal joined.

E. Shear Studs: Shall be shear connectors with proper ferrules and accessories, especially designed to create composite deck action between concrete deck and the supporting beam. Steel for studs shall conform to ASTM A108, Grades 1015-1020, with a minimum tensile strength of 60,000 psi. Studs shall be of uniform diameter, heads shall be concentric and normal to shaft and the weld end shall be chamfered, welds shall be solid flux.

F. Primer and Touch-Up Paint:
1. For Standard Shop Coat: Red oxide primer, meeting the requirements of SSPC-Paint 25. Refer to items below which shall not receive paint/primer. Zinc Chromate not permitted.
2. For Architecturally Exposed Steel Members: First coat Tnemec-Zinc 90-97 and second coat Tnemec Series 66, Hi-Build Epoxoline; or PPG No. 97-670 Zinc Primer with second coat of PPG No. 97-130 HB Epoxy; or Architect approved equal; in color selected by Architect.
3. For Field Touch-Up: Same paint as specified for shop primer coat.
4. Galvanizing: When galvanized steel is required, conform to the following:
    a. Steel: Provide zinc-coating to conform to ASTM A 123.
    b. Threaded Products: Provide zinc-coating to conform to ASTM A 153, Class C.
    c. Steel Sheet: Provide zinc-coating to conform to ASTM A 897.

G. Galvanizing Repair Paint: ZRC Cold Galvanizing Compound or Galvilite manufactured by ZRC Worldwide, Marshfield, MA; Galvax Zinc-rich Cold Galvanizing Coating manufactured by Alvin Products, Inc., Lawerence, MA; or paint complying with military specification MILP-21035A, Type I or II. Apply repair paint in accordance with ASTM A780.

H. Slide Bearings: Reinforced teflon, factory pre-bonded to steel plates with initial static coefficient of friction not exceeding 0.06 at the

interface, over a working stress range of 500 to 2000 psi. Bearing shall be one (1) of the following:

1. "Fluorogold" slide bearings manufactured by the Fluorocarbon Company, Pine Brook, New Jersey.
2. "Con-Slide" slide bearings manufactured by Con-Serv, Inc. East Hampton, New Jersey.

I. Shrinkage-Resistant Grout:

1. Type: Premixed, nonshrink, nonmetallic grout, ASTM C1107.
2. Applicable Standards: Corps of Engineers CRD-C 621, with the following exceptions:
   a. Provide a maximum initial set time of 1 hour at 73.4F (+ 5F) and 50% RH.
   b. Minimum compressive strength at 28 days shall be 8,000 psi when placed at fluid consistency.
   c. Expansion shall not be formed by gas liberation.
3. Approved Manufacturers: Specifications are based on first named manufacturer. Other approved manufacturers must meet or exceed this standard.
   a. "Supreme", Gifford-Hill & Company, Inc., Dallas, Texas 75247 (214) 258-7000.
   b. "Masterflow 713", Master Builders Division of Martin Marietta, Cleveland, Ohio 44122 (216) 831-5500.
   c. "Saureisen F-100", Sauereisen Cements Co., Pittsburgh, Pennsylvania 15238 (412) 963-0303.

2.3 FABRICATION

A. Shop Fabrication and Assembly:

1. Fabricate and assemble structural assemblies in the shop to the greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings.
2. Provide camber in members where indicated. Specified camber applies as at jobsite, just prior to erection, lying down flat so that member weight has no effect. Contractor shall take necessary precautions to prevent or compensate for camber loss during shipment. Measured camber in members up to 50 feet-0 inches long shall be within a tolerance of minus 1/2 inch to plus zero from the amount specified. For members greater than 50 feet-0 inches long, both positive and negative tolerance may increase 1/8 inch for every 10 feet-0 inches of length in excess of 50 feet-0 inches. Members with a field measured camber outside of the specified tolerance shall be returned to the shop.

3. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
4. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
5. Splicing of structural steel members is prohibited without prior approval of Architect. Any member having a splice not shown or detailed on approved shop drawings will be rejected.
6. Plates shall be free of gross internal discontinuities such as ruptures and delaminations. Plates shall comply with ASTM A 578, Level 1.
7. Mill Tolerances: Comply with ASTM A 6.
8. Fabrication Tolerances: Comply with AISC Code of Standard Practice.

B. Connections:
1. Weld or bolt shop connections as indicated on the Drawings.
2. Bolt field connections, except where welded connections or other connections are indicated. Provide specified threaded fasteners for all principle bolted connections. Holes for bolted connections shall be drilled or punched at right angles to member. The slope of surfaces under the bolt head and nut shall not exceed 1:20. Provide beveled washers where slopes exceed 1:20. Bolt holes shall have a diameter not greater than 1/16 inch larger than the nominal bolt diameter. Do not flame cut holes or enlarge holes by burning. Provide washers over all slotted holes in an outer ply.
3. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC, "Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts", approved by the Research Council on Structural Connections of the Engineering Foundation.
4. Welded Construction: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work. Assemble and weld built-up sections by methods which will produce true alignment of axis without warp. Welds not specified shall be continuous fillet welds designed to develop the full strength of member. No combination of bolts and welds shall be used for stress transmission at the same face of any connections.
5. Clean completed welds prior to inspection. Slag shall be removed from all completed welds and the weld and

adjacent base metal shall be cleaned by brushing or other suitable means. Tightly adherent splatter remaining after the cleaning operation is acceptable unless its removal is required for the purpose of nondestructive testing.

6. For high-strength, low-alloy steels, follow welding procedures recommended by steel producer for exposed and concealed connections.
7. Base Plates: Hole sizes for anchor bolts may be oversized to facilitate erection as follows:
   a. Bolts 3/4 inch to 7/8 inch Diameter: 5/16 inch oversize
   b. Bolts 1 inch to 2 inches Diameter: 1/2 inch oversize
   c. Bolts over 2 inches Diameter: 1 inch oversize

   Use oversize or plate washers under nut at all oversized holes in base plates. Washers must be large enough to cover the entire hole. Washer thickness shall be at least 1/8 of bolt diameter.

C. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Shop weld shear connectors, shaped as shown, to beams and girders in composite construction which do not support metal deck. Use automatic end welding of headed stud shear connectors in accordance with manufacturer's printed instructions.
   1. Installation of Shear Connectors: Shear studs shall be automatically end welded in the shop in accordance with Article 31 of the AWS Structural Welding Code and the specifications of the shear stud manufacturer. After installation, each ceramic ferrule shall be removed prior to placement of concrete. Adequate welding power must be available for studs being welded.
   2. All areas to which studs are to be attached shall be cleaned of all rust, oil, grease, and paint. When the mill scale is sufficiently thick to cause difficulty in obtaining proper welds, it shall be removed by grinding or sand blasting.

D. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on final shop drawings. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work. Cut, drill or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

E. Galvanized (Zinc-Coating): All structural steel pieces, exposed to weather or moisture, in permanent contact with soil, or accessible

to salt intrusion shall be hot dipped galvanized in accordance with ASTM A123, including, but not limited, to the following:

1. Exterior exposed steel columns and beams.
2. Exterior non-conditioned exposed steel under cover.
3. Masonry shelf angles.
4. Exterior exposed railings.
5. Miscellaneous structural metals placed in concrete.
6. Items shown on Drawings or required.

F. Architecturally Exposed Structural Steel: All exposed structural steel shall be straight and true. Select or straighten members to meet permissible variations of ASTM A6, subject to tolerances of AISC Code of Standard Practice, Chapter 10. Exposed surfaces shall be smooth, free of embedded scale, trademarks, roll imperfection marks, and other irregularities. Fill depressions of whatever kind with weld metal of the same composition as the parent metal. Grind welds and raised marks smooth and flush with adjacent surfaces.

2.4 SHOP PAINTING

A. General: Shop paint structural steel, those members or portions of members except as follows:

1. to receive a galvanized coating,
2. to be embedded in concrete or mortar,
3. surfaces which are to be welded,
4. to receive sprayed-on fireproofing, and
5. specifically noted as not shop prime painted

B. Surface Preparation: After inspection and before shipping, clean steel work to be painted. Remove loose rust, loose mill scale, splatter, and slag or flux deposits. Clean steel in accordance with SSPC recommendations as follows:

1. For exposed steel in conditioned spaces: SP-3, “Power Tool Cleaning”.
2. For exterior exposed steel: SP-6, “Commercial Blast Cleaning”.

C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer’s instructions and a rate to provide following dry film thickness. Use painting methods which result in full coverage of joints, corners, edges, and exposed surfaces.

1. For Standard Shop Coat: Apply specified primer to 2.0 mils.
2. For Architecturally Exposed Steel Members: Apply first coat specified primer to 3.5 mils and second coat specified primer to 4 to 6 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erector must examine areas and conditions under which structural steel work is to be installed, and notify Contractor of conditions detrimental to proper and timely completion of work.

3.2 ERECTION

A. General: Comply with AISC Specifications and Code of Standard Practice, and as herein specified.

B. Temporary Shoring and Bracing:
   1. Provide adequate shoring and bracing to safely withstand all loads to which the structure may be subjected during the construction process, including wind loads, dead loads, construction material, and equipment loads. Such bracing shall remain in place as long as required for safety.
   2. As the erection progresses, make a sufficient number of permanent welded or bolted connections to withstand erection stresses and maintain stability.
   3. The design of temporary shoring and bracing shall be the responsibility of the Contractor.

C. Temporary Planking: Provide temporary planking and platforms, as necessary, to effectively complete the work.

D. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work. Furnish templates and other devices necessary for presetting bolts and other anchors in accurate locations. Refer to Section 03 30 00, Cast-In-Place Concrete for anchor bolt installation requirements in concrete, and Section 04 20 00, Unit Masonry for anchor bolt installation requirements in masonry.

E. Field Assembly:
   1. Set structural frames accurately to the lines and elevations indicated.
   2. Align and adjust various members forming a part of a complete frame or structure before permanently fastening members together.
   3. Clean bearing surfaces and other surfaces before assembly which will be in a permanent contact, before assembly.
   4. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   5. Level and plumb individual members to structure within tolerances defined by AISC Code for Standard Practice,

unless closer tolerances are required for proper fitting of adjoining or enclosing materials, in which case the most stringent shall apply.

6. Set horizontal members with their natural camber (or specified camber) up.
7. Splice members only where indicated and accepted on final shop drawing.
8. Where parts cannot be assembled or fitted properly, as a result in errors in fabrication or of deformation due to handling or transportation, such condition shall be immediately reported to the Architect, along with proposed method of correction. The straightening of bends or warps shall be performed by approved methods. Bent or damaged heat-treated parts will be rejected.
9. Do not enlarge unfair holes in members by burning or by the use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts and weld connection continuously.
10. Do not use gas-cutting torches in the field for correcting fabrication errors in the structural framing, except on secondary members, which are not under stress. Finish gas-cut sections equal to a sheared appearance.

F. Erection Bolts:
1. On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.
2. On non-exposed welded construction, erection bolts shall be tightened securely and left in place, or if removed, the holes shall be filled with plug welds.

G. Bolted Connections:
1. High-strength bolts shall be installed in accordance with AISC, "Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts".
2. ASTM A 307 bolts and high-strength (ASTM A 325 and ASTM A 490) bolts noted to be "snug-tight" shall be tightened using a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench, bringing the plies into snug contact.
3. Bolted parts shall fit solidly together when assembled. All joint surfaces shall be free of burrs, dirt and other foreign material that would prevent solid seating of the parts.
4. Hardened washers shall be placed over slotted holes in an outer ply. Hardened beveled washers shall be used where outer face of bolted parts has a slope greater than 1:20 with respect to bolt axis.

H. Field Welding:
   1. Comply with AWS D1.1 and AISC Specifications for Structural Steel Buildings. Pay particular attention to surface preparation, preheating, sequence, and continuity of welds.
   2. Where heavy shapes are to be welded, comply with all special requirements contained in the AISC Specifications and AWS D1.1.
   3. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

I. Unfair Holes:
   1. Do not enlarge holes in members, by burning or by use of drift pins, except in secondary bracing members.
   2. Ream holes that require enlarging to admit bolts.

J. Gas Cutting:
   1. Do not use gas cutting torches in field for correcting fabrication errors in structural framing
   2. Cutting will be permitted only on secondary members which are not under stress, as acceptable to the Architect.
   3. Finish gas-cut sections equal to a sheared appearance when permitted.

K. Setting Bases and Bearing Plates:
   1. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean the bottom surface of base and bearing.
   2. Set loose and attached base plates and bearing plates for structural members on wedges, or other adjustable devices.
   3. Tighten the anchor bolts after the supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the base or bearing plate prior to placing grout.
   4. Mix and place grout in accordance with the manufacturer's instructions.
   5. Place grout solidly between bearing surfaces and bases or plates to ensure that no voids remain.
   6. Finish exposed grout surfaces.
   7. Protect installed materials, and allow grout to cure in accordance with manufacturer's instructions.

L. Field Touch-Up Painting:
   1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint.
   2. Apply paint to exposed areas with same materials as used for shop painting.

3. Apply by brush or spray, to provide a minimum dry film thickness of 2.5 mils for each coat.

3.3 CLEANING

A. Clean up all debris caused by the Work of this Section, keeping the area clean and neat at all times.

END OF SECTION

(Referenced from 2004 TxDOT, ITEM 440 Reinforcing Steel – references made to any other Sections of the 2004 TxDOT Manual shall become part of the Contract to be followed)

440.1. Description. Furnish and place reinforcing steel of the sizes and details shown on the plans.

440.2. Materials.

A. APPROVED MILLS:

Before furnishing steel, producing mills of reinforcing steel for the Department must be pre-approved in accordance with DMS-7320, "Qualification Procedure for Reinforcing Steel Mills," by the Construction Division, which maintains a list of approved producing mills. Reinforcing steel obtained from unapproved sources will not be accepted.

B. DEFORMED BAR AND WIRE REINFORCEMENT:

Unless otherwise shown on the plans, reinforcing steel must be Grade 60, and bar reinforcement must be deformed. Reinforcing steel must conform to one of the following:

- ASTM A 615, Grades 40 or 60;
- ASTM A 996, Type A, Grades 40 or 60;
- ASTM A 996, Type R, Grade 60, permitted in concrete pavement only (Furnish ASTM A 996, Type R bars as straight bars only and do not bend them. Bend tests are not required.); or
- ASTM A 706.

The provisions of this Item take precedence over ASTM provisions.

The nominal size, area, and weight of reinforcing steel bars covered by this Item are shown in Table 1. Designate smooth bars up to No. 4 by size number and above No. 4 by diameter in inches.

Table 1
Size, Area, and Weight of Reinforcing Steel Bars

Bar Size Number (in.)	Bar Size Number (mm)	Diameter (in.)	Area (Sq. in.)	Weight per Ft.
3	10	0.375	0.11	0.376
4	13	0.500	0.20	0.668
5	16	0.625	0.31	1.043
6	19	0.750	0.44	1.502
7	22	0.875	0.60	2.044
8	25	1.000	0.79	2.670
9	29	1.128	1.00	3.400
10	32	1.270	1.27	4.303
11	36	1.410	1.56	5.313
14	43	1.693	2.25	7.650
18	57	2.257	4.00	13.60

Note: Bar size numbers (in.) are based on the number of eighths of an inch included in the nominal diameter of the bar. Bar size numbers (mm) approximate the number of millimeters included in the nominal diameter of the bar.

C. SMOOTH BAR AND SPIRAL REINFORCEMENT**:**

Smooth bars and dowels for concrete pavement must have minimum yield strength of 60 ksi and 644 meet ASTM A 615. For smooth bars that are larger than No. 3, provide steel conforming to ASTM A 615 or meet the physical requirements of
ASTM A 36.

Spiral reinforcement may be smooth or deformed bars or wire of the minimum size or gauge shown on the plans. Bars for spiral reinforcement must comply with ASTM A 615, Grade 40; ASTM A 996, Type A, Grade 40; or ASTM A 675, Grade 80, meeting dimensional requirements of ASTM A 615. Smooth wire must comply with ASTM A 82, and deformed wire must comply with ASTM A 496.

D. WELDABLE REINFORCING STEEL:

Reinforcing steel to be welded must comply with ASTM A 706 or have a carbon equivalent (C.E.) of at most 0.55%. A report of chemical analysis showing the percentages of elements necessary to establish C.E. is required for reinforcing steel that does not meet ASTM A 706 to be structurally welded. These requirements do not pertain to miscellaneous welds on reinforcing steel as

defined in Section 448.4.B.1.a, “Miscellaneous Welding Applications.”

Calculate C.E. using the following formula:

$$C.E. = \%C + \frac{\%Mn}{6} + \frac{\%Cu}{40} + \frac{\%Ni}{20} + \frac{\%Cr}{10} - \frac{\%Mo}{50} - \frac{\%V}{10}$$

E. WELDED WIRE FABRIC:

For fabric reinforcement, use wire that conforms to ASTM A 82 or A 496. Use wire fabric that conforms to ASTM A 185 or A 497. Observe the relations shown in Table 2 among size number, diameter in inches, and area when ordering wire by size numbers, unless otherwise specified. Precede the size number for deformed wire with “D” and for smooth wire with “W.”

Designate welded wire fabric as shown in the following example: 6 × 12 – W16 × W8 (indicating 6-in. longitudinal wire spacing and 12-in. transverse wire spacing with smooth No. 16 wire longitudinally and smooth No. 8 wire transversely).

Table 2
Wire Size Number, Diameter, and Area

Size Number (in.)	Size Number (mm)	Diameter (in.)	Area (sq. in.)
31	200	0.628	0.310
30	194	0.618	0.300
28	181	0.597	0.280
26	168	0.575	0.260
24	155	0.553	0.240
22	142	0.529	0.220
20	129	0.505	0.200
18	116	0.479	0.180
16	103	0.451	0.160
14	90	0.422	0.140
12	77	0.391	0.120
10	65	0.357	0.100
8	52	0.319	0.080
7	45	0.299	0.070
6	39	0.276	0.060
5.5	35	0.265	0.055
5	32	0.252	0.050
4.5	29	0.239	0.045
4	26	0.226	0.040
3.5	23	0.211	0.035
2.9	19	0.192	0.035
2.5	16	0.178	0.025
2	13	0.160	0.020
1.4	9	0.134	0.014
1.2	8	0.124	0.012
0.5	3	0.080	0.005

Note: Size numbers (in.) are the nominal cross-sectional area of the wire in hundredths of a square inch. Size numbers (mm) are the nominal cross-sectional area of the wire in square millimeters. Fractional sizes between the sizes listed above are also available and acceptable for use.

F. EPOXY COATING:

Epoxy coating will be required as shown on the plans. Before furnishing epoxy-coated reinforcing steel, an epoxy applicator must be pre-approved in accordance with DMS-7330, "Qualification Procedure for Reinforcing Steel Epoxy Coating Applicators." The
Construction Division maintains a list of approved applicators.

Coat reinforcing steel in accordance with Table 3.

Table 3
Epoxy Coating Requirements for Reinforcing Steel

Material	Specification
Bar	ASTM A 775 or A 934
Wire or fabric	ASTM A 884 Class A or B
Mechanical couplers	As shown on the plans
Hardware	As shown on the plans

Use epoxy coating material and coating repair material that complies with DMS-8130, "Epoxy Powder Coating for Reinforcing Steel." Do not patch more than 1/4 in. total length in any foot at the applicator's plant.

Epoxy-coated reinforcement will be sampled and tested in accordance with Tex-739-I.

Maintain identification of all reinforcing throughout the coating and fabrication and until delivery to the project site.

Furnish 1 copy of a written certification that the coated reinforcing steel meets the requirements of this Item and 1 copy of the manufacturer's control tests.

G. MECHANICAL COUPLERS**:**

When mechanical splices in reinforcing steel bars are shown on the plans, use the following types of coupler:

- sleeve-filler,
- sleeve-threaded,
- sleeve-swaged, or
- sleeve-wedge.

Furnish only couplers that have been produced by a manufacturer that has been prequalified in accordance with DMS-4510, "Mechanical Couplers." Sleeve-wedge type couplers will not be permitted on coated reinforcing. Couplers for use on individual projects must be sampled and tested in accordance with DMS-4510. Furnish couplers only at locations shown on the plans.

440.3. Construction.

A. BENDING:

Cold-bend the reinforcement accurately to the shapes and dimensions shown on the plans. Fabricate in the shop if possible. Field-fabricate, if permitted, using

a method approved by the Engineer. Replace improperly fabricated, damaged, or broken bars at no additional expense to the Department. Repair damaged or broken bars embedded in a previous concrete placement using a method approved by the Engineer.
Unless otherwise shown on the plans, the inside diameter of bar bends, in terms of the nominal bar diameter (d), must be as shown in Table 4.

Table 4
Minimum Inside Diameter of Bar Bends

Bend	Bar Size Number (in.)	Bar Size Number (mm)	Diameter
Bends of 90° and greater in stirrups, ties, and other secondary bars that enclose another bar in the bend	3, 4, 5	10, 13, 16	4d
	6, 7, 8	19, 22, 25	6d
Bends in main bars and in secondary bars not covered above	3 through 8	10 through 25	6d
	9, 10, 11	29, 32, 36	8d
	14, 18	43, 57	10d

Note: Bar size numbers (in.) are based on the number of eighths of an inch included in the nominal diameter of the bar. Bar size numbers (mm) approximate the number of millimeters included in the nominal diameter of the bar.

Where bending No. 14 or No. 18 Grade 60 bars is required, bend-test representative specimens as described for smaller bars in the applicable ASTM specification. Make the required 90° bend around a pin with a diameter of 10 times the nominal diameter of the bar.

B. TOLERANCES:

Fabrication tolerances for bars are shown in Figure 1.

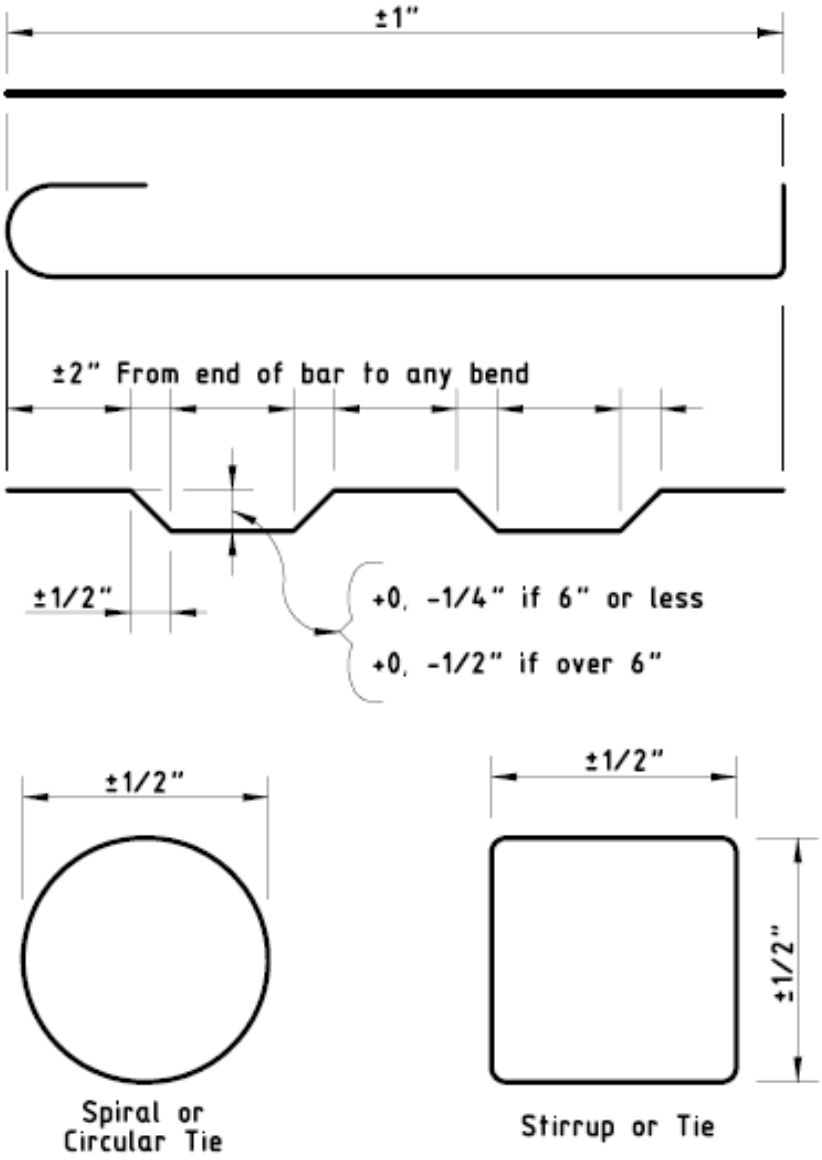

Figure 1
Fabrication tolerances for bars.

C. STORAGE:

Store steel reinforcement above the ground on platforms, skids, or other supports, and protect it from damage and deterioration. Ensure that reinforcement is free from dirt, paint, grease, oil, and other foreign materials when it is placed in the work. Use reinforcement free from defects such as cracks and delamination's. Rust, surface seams, surface irregularities, or mill scale will not be cause for rejection if the minimum cross-sectional area of a hand wire-brushed specimen meets the requirements for the size of steel

specified.

D. SPLICES:

Lap-splice, weld-splice, or mechanically splice bars as shown on the plans. Additional splices not shown on the plans will require approval. Splices not shown on the plans will be permitted in slabs 15 in. or less in thickness, columns, walls, and parapets. x Unless otherwise approved, splices will not be permitted in bars 30 ft. or less in plan length. For bars exceeding 30 ft. in plan length, the distance center-to-center of splices must be at least 30 ft. minus 1 splice length, with no more than 1 individual bar length less than 10 ft. Make lap splices not shown on the plans, but otherwise permitted, in accordance with Table 5. Maintain the specified concrete cover and spacing at splices, and place the lap-spliced bars in contact, securely tied together.

Table 5
Minimum Lap Requirements for Bar Sizes through No. 11

Bar Size Number (in.)	Bar Size Number (mm)	Uncoated Lap Length	Coated Lap Length
3	10	1 ft. 4 in.	2 ft. 0 in.
4	13	1 ft. 9 in.	2 ft. 8 in.
5	16	2 ft. 2 in.	3 ft. 3 in.
6	19	2 ft. 7 in.	3 ft. 11 in.
7	22	3 ft. 5 in.	5 ft. 2 in.
8	25	4 ft. 6 in.	6 ft. 9 in.
9	29	5 ft. 8 in.	8 ft. 6 in.
10	32	7 ft. 3 in.	10 ft. 11 in.
11	36	8 ft. 11 in.	13 ft. 5 in.

Note: Bar size numbers (in.) are based on the number of eighths of an inch included in the nominal diameter of the bar. Bar size numbers (mm) approximate the number of millimeters included in the nominal diameter of the bar.

- Do not lap No. 14 or No. 18 bars.
- Lap spiral steel at least 1 turn.
- Splice welded wire fabric using a lap length that includes the overlap of at least 2 cross wires plus 2 in. on each sheet or roll. Splices using bars that develop equivalent strength and are lapped in accordance with Table 5 are permitted.
- For box culvert extensions with less than 1 ft. of fill, lap the existing longitudinal bars with the new bars as shown in Table 3. For extensions with more than 1 ft. of fill, lap at least 1 ft. 0 in.
- Ensure that welded splices conform to the requirements of the plans and

of Item 448, “Structural Field Welding.” Field-prepare ends of reinforcing bars if they will be butt-welded. Delivered bars must be long enough to permit weld preparation.

- Install mechanical coupling devices in accordance with the manufacturer’s recommendations at locations shown on the plans. Protect threaded male or female connections, and make sure the threaded connections are clean when making the connection. Do not repair damaged threads.
- Mechanical coupler alternate equivalent strength arrangements, to be accomplished by substituting larger bar sizes or more bars, will be considered if approved in writing before fabrication of the systems.

E. PLACING:

Unless otherwise shown on the plans, dimensions shown for reinforcement are to the centers of the bars. Place reinforcement as near as possible to the position shown on the plans. In the plane of the steel parallel to the nearest surface of concrete, bars must not vary from plan placement by more than 1/12 of the spacing between bars. In the plane of the steel perpendicular to the nearest surface of concrete, bars must not vary from plan placement by more than 1/4 in. Cover of concrete to the nearest surface of steel must be at least 1 in. unless otherwise shown on the plans.

For bridge slabs, the clear cover tolerance for the top mat of reinforcement is .0, +1/2 in.

Locate the reinforcement accurately in the forms, and hold it firmly in place before and during concrete placement by means of bar supports that are adequate in strength and number to prevent displacement and to keep the steel at the proper distance from the forms. Support bars by standard bar supports with plastic tips, approved plastic bar supports, or precast mortar or concrete blocks when supports are in contact with removable or stay-in-place forms. Use bright basic bar supports to support reinforcing steel placed in slab overlays on concrete panels or on existing concrete slabs. Bar supports in contact with soil or subgrade must be approved.

For bar supports with plastic tips, the plastic protection must be at least 3/32 in. thick and extend upward on the wire to a point at least 1/2 in. above the formwork. All accessories such as tie wires, bar chairs, supports, or clips used with epoxy-coated reinforcement must be of steel, fully coated with epoxy or plastic. Plastic supports approved by the Engineer may also be used with epoxy-coated reinforcement.

Cast mortar or concrete blocks to uniform dimensions with adequate bearing

area. Provide a suitable tie wire in each block for anchoring to the steel. Cast the blocks to the thickness required in approved molds. The surface placed adjacent to the form must be a true plane, free of surface imperfections. Cure the blocks by covering them with wet burlap or mats for a period of 72 hr. Mortar for blocks should contain approximately 1 part hydraulic cement to 3 parts sand. Concrete for blocks should contain 850 lb. of hydraulic cement per cubic yard of concrete.

Place individual bar supports in rows at 4-ft. maximum spacing in each direction. Place continuous type bar supports at 4-ft. maximum spacing. Use continuous bar supports with permanent metal deck forms.

The exposure of the ends of longitudinal, stirrups, and spacers used to position the reinforcement in concrete pipe and in precast box culverts or storm drains is not cause for rejection.

Tie reinforcing steel for bridge slabs, top slabs of direct traffic culverts, and top slabs of pre-stressed box beams at all intersections, except tie only alternate intersections where spacing is less than 1 ft. in each direction. For reinforcing steel cages for other structural members, tie the steel at enough intersections to provide a rigid cage of steel. Fasten mats of wire fabric securely at the ends and edges.

Before concrete placement, clean mortar, mud, dirt, debris, oil, and other foreign material from the reinforcement. Do not place concrete until authorized.

If reinforcement is not adequately supported or tied to resist settlement, reinforcement is floating upward, truss bars are overturning, or movement is detected in any direction during concrete placement, stop placement until corrective measures are taken.

F. HANDLING, PLACEMENT, AND REPAIR OF EPOXY-COATED REINFORCING STEEL:

1. Handling: Provide systems for handling coated reinforcement with padded contact areas. Pad bundling bands or use suitable banding to prevent damage to the coating. Lift bundles of coated reinforcement with a strong back, spreader bar, multiple supports, or a platform bridge. Transport the bundled reinforcement carefully, and store it on protective cribbing. Do not drop or drag the coated reinforcement.

2. Construction Methods: Do not flame-cut coated reinforcement. Saw or shear-cut only when approved. Coat cut ends as specified in Section 440.3.F.3, “Repair of Coating.” Do not weld or mechanically couple coated reinforcing steel except where specifically shown on the plans.

Remove the epoxy coating at least 6 in. beyond the weld limits before welding and 2 in. beyond the limits of the coupler before assembly. After welding or coupling, clean the steel of oil, grease, moisture, dirt, welding contamination (slag or acid residue), and rust to a near-white finish. Check the existing epoxy for damage. Remove any damaged or loose epoxy back to sound epoxy coating.

After cleaning, coat the splice area with epoxy repair material to a thickness of 7 to 17 mils after curing. Apply a second application of repair material to the bar and coupler interface to ensure complete sealing of the joint.

3. Repair of Coating**:** For repair of the coating, use material that complies with the requirements of this Item and ASTM D 3963. Make repairs in accordance with procedures recommended by the manufacturer of the epoxy coating powder. For areas to be patched, apply at least the same coating thickness as required for the original coating. Repair all visible damage to the coating. Repair sawed and sheared ends, cuts, breaks, and other damage promptly before additional oxidation occurs. Clean areas to be repaired to ensure that they are free from surface contaminants. Make repairs in the shop or in the field as required.

00440.4. MEASUREMENT AND PAYMENT

A. When listed as a separate contract pay item, shall be measured in accordance with "Measurement and Basis of Payment" section or as shown on the Bid Proposal Form.

B. When not listed as a separate contract pay item, shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 05 50 00 – MISCELLANEOUS METALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Miscellaneous metal items and their related components, which are not necessarily individually described, shall be furnished and installed in accordance with the intent of the drawings and specifications and as required to complete the work.

B. The Work of this Section is governed by Section 05 12 00, Structural Steel, except where more stringent requirements are contained herein or on the Structural Drawings. If a conflict exists, notations on the Structural Drawings take precedence.

1.2 REFERENCES

A. Conform to the following reference standards as applicable to the work:

1. American Institute of Steel Construction (AISC), Code of Standard Practice for Steel Buildings and Bridges, latest edition.
2. American Institute of Steel Construction (AISC), Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings, latest edition.
3. American Iron and Steel Institute (AISI)
4. ASTM International (ASTM)
    a. A36, Standard Specification for Carbon Structural Steel
    b. A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
    c. A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
    d. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
    e. A307, Standard Specification for Carbon Steel Bolts and Studs 60,000 psi Tensile Strength
    f. B209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
    g. B210, Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes
    h. B221, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
5. American Welding Society (AWS)

a. D1.1 Structural Welding Code

6. Steel Structures Painting Council (SSPC)
   a. Painting Manual, Volume 1, Good Painting Practice
   b. Painting Manual, Volume 2, Systems Specifications
7. National Ornamental & Miscellaneous Metals Association (NOMMA)
   a. Guideline 1 – Joint Finishes.

1.3 SUBMITTALS

A. Shop Drawings:
   1. For off-the-shelf items: Show all layouts, sizes, methods of construction and installation, including sizes and types of all fastening devices.
   2. For custom fabricated items: Submit design calculations for the materials and their connections designed by the Contractor, prior to or with the shop drawings. Calculations shall bear the seal of a Registered Professional Engineer, licensed in the State of Texas. Shop drawings containing connections for which calculations have not been received will be returned unchecked as an incomplete submittal. Design Calculations will be retained for the Engineer's file, and will not be approved or returned.

B. Samples: As noted.

1.4 CONTRACTOR'S RESPONSIBILITIES

A. As scope and performance documents, the Drawings and Specifications do not necessarily indicate or describe all the work required for the performance and completion of the Work. Contracts will be let on the basis of such documents with the understanding that the Contractor shall furnish and install the items required for proper completion of the Work without adjustment to price or schedule. Work shall be of sound, quality construction and the Contractor shall be solely responsible for the inclusions of adequate labor and materials to cover the proper and timely fabrication and installation of the miscellaneous metal items indicated, described, or implied.

B. As a performance specification, the criteria for the solution of structurally sound miscellaneous metal items indicated on the Drawings or specified herein are the sole purpose of defining the design intent and performance requirements. The details shown are intended to emphasize the acceptable profiles and performance requirements for this Project. To avoid any misunderstanding or lack

of interpretation, the Contractor is hereby advised that the responsibility for the miscellaneous metal items are totally his and that designs and resolutions proposed in the Contractor's shop drawings, structural calculations, and related documentation shall be demonstrated throughout the Work and warranty period specified or required.

C. Design proposal submissions which follow exactly the details indicated on the Drawings, will not relieve the Contractor of his responsibility for the design, fabrication, erection, or performance of the Work of this Section.

D. In the event of a controversy over the design, the decision of the Engineer will take precedence.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel: Comply with ASTM A36.

B. Welding:
   1. Comply with American Welding Society (AWS) Code.
   2. Comply with National Ornamental & Miscellaneous Metals Association (NOMMA Guideline 1: Joint Finishes) for joint finishes in the following locations:
      a. Finish #1: Interior handrails and guardrails
      b. Finish #2: Typical ornamental metals exposed to view, interior and exterior, except as indicated above. (Canopies, exterior railings and guardrails, non-accessible sculptural fabricated metal, etc.)
      c. Finish #3: Miscellaneous metals exposed interior non-public spaces, and exterior miscellaneous metals, except as indicated above. (ladders, bollards, etc.)
      d. Concealed welding: no requirement, unless otherwise indicated or required for safety or conformance with requirements of other portions of the work.

C. Bolts:
   1. Comply with ASTM A307.
   2. Size: 3/4 inch, unless otherwise noted.

D. Anchors:
   1. Expansion bolts:
      a. 1/4 inch or less, Rawl Calk-Ins or Arrow Series 4000.
      b. Greater than 1/4 inch: Rawl Multi-Calks. Top shall be 1/2 inch below concrete surface.
   2. Molly screw anchors:

a. In walls 1/16 inch to 5/8 inch thick, use "S" length
b. In walls 5/8 inch to 1/4 inch thick, use "L" length
c. In walls 1-1/4 inch to 1-3/4 inch thick, use "XL": length.

3. Nelson stud anchors:
   a. Comply with ASTM A108.
   b. Concrete Embed: Headed, low carbon steel, non-threaded, galvanized, standard ferrule as required

E. Shop Priming:
1. Shop coat any un-galvanized ferrous metal with primer, except for those to receive application of spray-applied fireproofing shall be free of primer and paint.
2. Clean iron and metal to be primed of scale, dirt and dust by steel scrapers, wire brushers or sandblasting. Remove oil and grease with petroleum naphtha.
3. Thoroughly work paint into all joints by brush. Overall application of brush or spray coat of red oxide primer in accordance with SSPC - Paint 25.
4. Give any painted built-in portions one field coat of primer on all abraded parts after installation.

F. Galvanized Metal:
1. Comply with ASTM A123.
2. General: Galvanize all steel sections which are fully or partially exposed to weather, regardless if they are scheduled to receive a finish coat of paint or not.
3. Galvanized items to be painted shall be primed as outlined in Painting and Staining Section.
4. Hot-dip galvanized after fabrication.
5. Silicone protective coating shall not be used at galvanized items scheduled to receive paint.
6. Galvanizing Repair Paint: ZRC cold galvanizing compound or Galvilite manufactured by ZRC Worldwide, Marshfield, MA; Galvax Zinc-rich Cold Galvanizing Coating manufactured by Alvin Products, Inc., Lawerence, MA; or paint complying with military specification MILP-21035A, Type I or II. Apply repair paint in accordance with ASTM A780.

G. Stainless Steel:
1. General: Comply with ASTM Standards as applicable to the work.
2. Type: Type 302 or 304 as applicable to the work.
3. Finish:
   a. Concealed: No. 2D finish
   b. Exposed: No. 4, unless noted otherwise.

H. Aluminum:
1. General: Comply with ASTM Standards as applicable to work.

2. Type: 6061 or 6063 as applicable to work.
3. Finish:
    a. Concealed: Mill finish
    b. Exposed: Mill finish, or Anodized or Kynar 500 or Hylar 5000 finish a specified in color selected by Architect from manufacturer's standard colors.

2.2 MISCELLANEOUS METAL ITEMS

A. The following is a list of the principal miscellaneous metal items to be furnished under this Section. This list is offered only as a guide and Contractor shall thoroughly check drawings for other miscellaneous metals. All items exposed to the exterior shall be hot-dip galvanized after fabrication.
    1. Guard Post (Bollards): Provide 6.625 inch O.D. Schedule 40 hot-dip galvanized steel pipe guard post (bollards) as detailed on the drawings. Fill with 2,500 PSI concrete after installation and round off concrete top. Place in concrete footing as detailed on drawings. Galvanize pipe after fabrication. Paint as directed by Architect.
    2. Removable Guard Post (Bollards): Provide 5.047 inch I.D. Schedule 40 hot-dip galvanized steel pipe sleeve with 1-1/2 inch by 1-1/2 inch by 1/4 inch by 2 inch steel angle with 1/2 inch diameter hole for lock welded to pipe as detailed on the drawings. Plug bottom of pipe to keep from filling with concrete from footing. Place in concrete footing as detailed on drawings. Provide 4.50 inch O.D. Schedule 40 hot-dip galvanized steel pipe insert with 1-1/2 inch by 1-1/2 inch by 1/4 inch by 2 inch steel angle with 1/2 inch diameter hole for lock welded to pipe as detailed on the drawings. Fill smaller diameter pipe with 2,500 PSI concrete after installation and round off concrete top. Hot-dip galvanize all components after fabrication. Paint as directed by Architect.
    3. Sign Posts:
        a. Accessible Parking Sign Posts: 2 inch by 12 inch galvanized steel tube with integral welded galvanized post cap, painted in color selected by Architect.
            1) Post Anchor Bolts: Two (2) galvanized 1/2 inch by 6-1/8 inch Nelson stud anchor bolts welded to steel tube front and back.
        b. Signs: Refer to Section Graphics.
    4. Handrails and Brackets:
        a. Steel Pipe Handrails and Brackets: Furnish and install 1-1/2 inch O.D. Schedule 40 steel pipe rails for outdoor

stairs and ramps, unless noted otherwise. Brackets shall be wall type. Include all other components required for finished installation. All work shall comply with local codes and Texas Accessibility Standards (TAS). Hot dip galvanized all components after fabrication.

b. Aluminum Handrails and Brackets: Furnish and install 1-1/2 inch O.D. aluminum pipe rails for indoor stairs and ramps, unless noted otherwise. Brackets shall be wall type. Include all other components required for finished installation. All work shall comply with local codes and Texas Accessibility Standards (TAS).

5. Steel Ladders: Fabricate from 2-1/2 inch by 3/8 inch flat bar steel stringer with 3/4 inch steel rod rungs let into stringers, welded and ground smooth. Provide all angle supports and anchoring devices for bolting to wall, floor, or structure as required. Hot-dip galvanize after fabrication.
6. Steel Ships Ladders: Fabricate from steel shapes as shown, weld joints and grind smooth. Provide cages where shown. Hot-dip galvanize after fabrication. Masonry Anchors (At steel columns): Fabricate from 5/16 inch dia. steel, galvanized after fabrication; field weld to columns, space not more than 24 inches o.c. vertically to coincide with horizontal mortar joint elevations. Refer to Structural Drawings.
7. Loose Lintels: Fabricate from steel shapes as shown on drawings, weld joints and grind smooth. Hot-dip galvanize after fabrication.
8. Frame Supports: Construct above ceiling frame supports for aluminum entrances and storefronts, hollow metal frames of channels and/or tubes, with all anchorage devices as detailed or required.
9. Below and Above-Ceiling Supports: Construct of UNISTRUT members or as approved by Architect to size and shaped detailed. All work shall be accurate to 1/8 inch plus or minus. Provide supports complete with fastenings to structure for overhead equipment.
10. Shelf Angles for Masonry: Sizes and shapes as detailed. Use specified galvanized steel for angles on exterior walls. Paint exposed surfaces as directed by Architect.
11. Access Doors: Provide one (1) 2 feet-0 inches by 2 feet-0 inches at each restroom plumbing chase wall. If not shown on drawings, locate as indicted by Architect's field representative. Approved Manufacturers: Bar-Co., Cesco Products, J. L. Industries, Karp Associates, Milcor Inc., Nystrom Inc., and The Williams Brothers Corp. Provide painted finish.

12. Foot Scrapers: Fabricate from steel shapes as shown on drawings, weld joints and grind smooth. Hot dip galvanize after fabrication.
13. Condenser Water Pump Base Plate: Fabricate from steel plate with holes for anchor bolts as shown on drawings or required. Hot dip galvanize after fabrication. Provide stainless steel anchor bolts of size, type, and finish as shown or recommended by fabricator to suit application.
14. Stair Safety Nosings:
    a. American Safety Tread Co.
        1) Provide Model 24 at all concrete stairs (concrete risers and treads - not steel pan stairs).
        2) Provide Model 9311 at steel pan stairs to receive a paver tile finish.
        3) Provide Model 8511 at sloped riser - steel pan stairs with a sealed concrete finish.
    b. Additional approved manufacturers:
        1) Balco/Metalines
        2) Safe T Metal Co.
        3) Schluter Systems
        4) Wooster Products, Inc.
15. Conduit Trenches, Frames and Covers:
    a. Trench Pan: Heavy Metal Form Pan with 12 inch interior trench width dimension and four (4) inch depth.
    b. Trench: Type EXTC-B with Type R Cover with recess design to accept vinyl composition tile. Cover shall be set 1/8 inch above concrete floor so that the finished top is flush with the finished VCT floor.
    c. Locations: As shown on drawings.
    d. Acceptable Manufacturer: McKinley Iron Works, Fort Worth, Texas; (800) 792-2273, or Architect approved equal.
16. Sidewalk Trench Covers and Frames: Provide trench covers and frames at sidewalks where shown on drawings or required. Approved Product/Manufacturers: Type TGLB-10 as manufactured by McKinley Iron Works, Fort Worth, Texas; (800) 792-2273; Barrycraft Pedestrian- Handicap/Bicycle Trench Grating B-PED-A2 as manufactured by Barry Pattern & Foundry Company, Inc. Birmingham, Alabama (800) 524-1809; or Architect approved equal.
17. Cast Iron Downspout Boots: Provide cast iron downspout boots conforming to Type DS4 as manufactured by McKinley Iron Works, Inc., Fort Worth, TX; (800) 792-2273, or Architect approved equal. Provide downspout boots with standard rust

inhibitive primer. Paint downspout boots in the field to match the color of downspouts as selected by Architect.

18. Bicycle Racks: Provide and install (3) Single entry bicycle racks. Design Basis for bicycle racks is Porter model number 00391-000. Bicycle Racks shall consist of unitized welded spreader frame constructed from galvanized steel. The unit is approximately 10'-6" long by 3'-6" wide and each shall be constructed to hold (10) bicycles. All hardware and labor shall be provided to anchor the units to the concrete sidewalk as depicted in the drawings.
19. Decorative Aluminum Guardrail and Handrail System:
    a. Panels: All panels are pre-designed 30 inch square aluminum modules with design as indicated on drawings. Powder coated finish shall be as selected by Architect from manufacturer's available colors.
    b. Posts: Standard aluminum post shall be two (2) inches by three (3) inches. Corner post application shall use a three (3) inch square section or, if not a 90 degree corner application, two (2) posts shall be used either side of the corner. Posts shall be mounted to the structure by welding the internal steel supporting structure to an embedded steel plate. Post finish shall be powder coated in color selected by Architect from manufacturer's available colors.
    c. Handrail: 1-1/2 inch O.D. aluminum pipe in satin, non-directional finish.
    d. Location: Second Floor and stairs as indicated on the drawings.
    e. Approved Product/Manufacturer: Design Basis for Panel Railing System as manufactured by Livers Bronze Company, Kansas City, MO (816) 300-2828;
    Architectural Metal Crafts, Houston, TX (281) 449-1881; Big D Metalworks, Dallas, TX (800) 299-9767; Sterling Dula, Austin, TX (512) 794-8617; York Metal Fabricators, Inc., Oklahoma City, OK (405) 528-7495; or Architect approved equal; refer to Division 1 for substitutions process.
20. Field Fabricated Ornamental Railing:
    a. Panels: 2 feet-6 inches by 2 feet-6 inches, steel, paint, match design configuration and intermediate panel component sizes similar to Livers Bronze Style No. 18.
    b. Posts: As shown on drawings, steel, paint.
    c. Corner Posts: As shown on drawings, steel, paint.
    d. Cap Rail:

1) Style: 3-1/2 inch O.D. Rail Cap.
2) Metal: Extruded aluminum, clear anodized.

e. Side Rail: 1-1/2-inch diameter extruded aluminum handrail and bracket as specified above.

f. Finish:
1) Paint Color: As selected by Architect from manufacturer's available colors.

21. Catwalk Structure: Fabricate from steel shapes as shown on drawings. Fabricate floor from standard metal bar grating with rectangular bearing bars and cross bars of size and spaced as required and recommended by NAAMM. Cross bars shall be welded or fused to bearing bars. Ends of grating shall be banded at supports. Weld grating to supports at bearing bars and banded ends. Align all bars in adjacent panels. Provide attachments and all catwalk accessories and miscellaneous supports as indicated. Weld all joints and grind smooth. Shop prime paint and field paint under Paint Section.
a. Stage Area: Provide catwalk accessories and miscellaneous supports as indicated. Refer to Architectural, Structural, and Stage Theater Drawings.

22. Aluminum Column Covers:
a. Covers shall be extruded aluminum, .145 thickness with clear anodized finish, fabricated in two vertically divided sections attached with demountable interlock assembly.
b. Fasteners: concealed.
c. Manufacturer to provide support structures
d. Locations: as shown on drawings.
e. Basis of Design: Series 2000 by Pittconn Industries, Riverdale, MD; (800) 637-7638; or Architect approved equal.

B. Other Miscellaneous Items: Miscellaneous metal items and their related components are not necessarily individually described. Miscellaneous items not described shall be furnished and installed in accordance with the intent of the drawings and specifications and as required to complete the work.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Separate all dissimilar metals.

B. Welded Joint Finishes: Where welding is exposed to view, welds shall be executed neatly then ground smooth. Pits and blemishes are not acceptable. Provide joints as stated above in accordance with NOMMA Guideline 1.

C. For manufactured items, adhere to printed manufacturer's installation instructions.

D. Refer to painting section for items that are to receive paint.

END OF SECTION

SECTION 061753 – SHOP FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Wood roof trusses.
   2. Wood floor trusses.
   3. Wood girder trusses.

B. Related Requirements:
   1. Section 313116 "Termite Control" for site application of borate treatment to wood trusses.

1.3 ALLOWANCES

A. Provide wood truss bracing under the Metal-Plate-Connected Truss Bracing Allowance as specified in Section 012100 "Allowances."

1.4 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For **wood-preservative-treated lumber, fire-retardant-treated lumber,** metal-plate connectors, metal truss accessories, and fasteners.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification from treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification from treating plant that treated

materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.

3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to truss fabricator.

B. Sustainable Design Submittals:
   1. None.

C. Shop Drawings: Show fabrication and installation details for trusses.
   1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
   2. Indicate sizes, stress grades, and species of lumber.
   3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
   4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
   5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
   6. Show splice details and bearing details.

D. Delegated-Design Submittal: For wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer, licensed in the State of Texas, responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For **Truss manufacturer**, **Professional Engineer and Fabricator**.
B. Material Certificates: For dimension lumber specified to comply with minimum specific gravity. Indicate species and grade selected for each use and specific gravity.
C. Product Certificates: For wood trusses, signed by officer of truss-fabricating firm.
D. Evaluation Reports: For the following, from ICC-ES:
   1. Wood-preservative-treated lumber.
   2. Fire-retardant-treated wood.

3. Metal-plate connectors.
4. Metal truss accessories.

1.7 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
   1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
   2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that **participates in a recognized quality-assurance program, complies with quality-control procedures in TPI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Engineer and authorities having jurisdiction and is certified for chain of custody by an FSC-accredited certification body**.

C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
   1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
   2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
   3. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, Licensed in The State of Texas, to design metal-plate-connected wood trusses.

B. Structural Performance: Wood trusses shall be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.
   1. Design Loads: As indicated on Drawings.
   2. Maximum Deflection under Design Loads:
      a. Roof Trusses: Vertical deflection of **1/360** of span.
      b. Floor Trusses: Vertical deflection of **1/480** of span.

C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.

D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.2 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. Provide dressed lumber, S4S.
   4. Provide dry lumber with **19** percent maximum moisture content at time of dressing.

B. Minimum Chord Size for Roof Trusses: **2 by 6 inches nominal (38 by 140 mm actual) for both top and bottom chords**.

C. Minimum Specific Gravity for Top Chords: **0.50**.

D. Permanent Bracing: Provide wood bracing.

2.3 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 **for interior construction not in contact with the ground,**

Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. For exposed trusses indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
   1. For exposed trusses indicated to receive a stained or natural finish, **mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency**.

D. Application: Treat **all trusses**.

2.4 FIRE-RETARDANT-TREATED WOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products according to test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
   1. Use treatment that does not promote corrosion of metal fasteners.
   2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
   3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use for interior locations where exterior type is not indicated.
   4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841. **For enclosed roof framing and framing in attic spaces, and where high-temperature**

fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.

C. Kiln-dry lumber after treatment to a maximum moisture content of **19** percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

1. For exposed trusses and bracing indicated to receive a stained or natural finish, **mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency**.

E. For exposed trusses indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat **all trusses unless otherwise indicated.**

1. Floor trusses.
2. Roof trusses.

2.5 METAL CONNECTOR PLATES

A. General: Fabricate connector plates to comply with TPI 1.

B. Hot-Dip Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 (Z180) coating designation; and not less than 0.036 inch (0.9 mm) thick.

1. Use for interior locations unless otherwise indicated.

C. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.

1. Use for wood-preservative-treated lumber and where indicated.

D. Stainless-Steel Sheet: ASTM A 666, [**Type 304**] [**Type 316**], and not less than 0.035 inch (0.88 mm) thick.

1. Use for exterior locations**, wood-preservative-treated lumber, fire-retardant treated lumber,** and where indicated.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.

2. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners **with hot-dip zinc coating complying with ASTM A 153/A 153M** or **Type 304 stainless steel**.

B. Nails, Brads, and Staples: ASTM F 1667.

2.7 METAL FRAMING ANCHORS AND ACCESSORIES

A. Allowable design loads, as published by manufacturer, shall comply with or exceed those **indicated**. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
   1. Use for interior locations unless otherwise indicated.

C. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.
   1. Use for wood-preservative-treated lumber and where indicated.

D. Stainless-Steel Sheet: ASTM A 666, **Type 304** or **Type 316**.
   1. Use for exterior locations and where indicated.

E. Truss Tie-Downs: Bent strap tie for fastening roof trusses to wall studs below, 1-1/2 inches (38 mm) wide by 0.050 inch (1.3 mm) thick. **Tie fastens to one side of truss, top plates, and side of stud below.**

F. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to wall studs below, 2-1/4 inches (57 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of truss and fastens to both sides of truss, top plates, and one side of stud below.

G. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to wall studs below, 2-1/2 inches (63 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of truss and fastens to both sides of truss, inside face of top plates, and both sides of stud below.

H. Roof Truss Clips: Angle clips for bracing bottom chord of roof trusses at non-load-bearing walls, 1-1/4 inches (32 mm) wide by 0.050 inch (1.3 mm) thick. Clip is fastened to truss through slotted holes to allow for truss deflection.

I. Floor Truss Hangers: U-shaped hangers, full depth of floor truss, with 1-3/4-inch- (44-mm-) long seat; formed from metal strap 0.062 inch (1.6 mm) thick with tabs bent to extend over and be fastened to supporting member.

J. Roof Truss Bracing/Spacers: U-shaped channels, 1-1/2 inches (38 mm) wide by 1 inch (25 mm) deep by 0.040 inch (1.0 mm) thick, made to fit between two adjacent trusses and accurately space them apart, and with tabs having metal teeth for fastening to trusses.

K. Drag Strut Connectors: Angle clip with one leg extended for fastening to the side of girder truss.
   1. Angle clip is 3 by 3 by 0.179 by 8 inches (76 by 76 by 4.55 by 203 mm) with extended leg 8 inches (203 mm) long. Connector has galvanized finish.
   2. Angle clip is 3 by 3 by 0.239 by 10-1/2 inches (76 by 76 by 6.07 by 267 mm) with extended leg 10-1/2 inches (267 mm) long. Connector has painted finish.

2.8 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 92 percent zinc dust by weight.

2.9 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.

C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
   1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

2.10 SOURCE QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.
   1. Provide special inspector with access to fabricator's documentation of detailed fabrication and quality-control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards.

2. Provide special inspector with access to places where wood trusses are being fabricated to perform inspections.

B. Correct deficiencies in Work that special inspections indicate do not comply with the Contract Documents.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

F. Space trusses **as indicated** on drawings; adjust and align trusses in location before permanently fastening.

G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.

H. Securely connect each truss ply required for forming built-up girder trusses.

1. Anchor trusses to girder trusses as indicated.

I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

1. Install bracing
2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.

J. Install wood trusses within installation tolerances in TPI 1.

K. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.

L. Replace wood trusses that are damaged or do not comply with requirements.

1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Engineer.

3.2 REPAIRS AND PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
B. Protect wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
C. Repair damaged galvanized coatings on exposed surfaces according to ASTM A 780/A 780M and manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections to verify that temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.

END OF SECTION

SECTION 06 40 00 – FINISH AND ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.01 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.02 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY:

A. This Section includes the following:
   1. Interior standing and running trim and trails.
   2. Wood cabinets (casework).
   3. Laminate clad cabinets (plastic-covered casework).
   4. Cabinet tops (countertops) and chair rails.
   5. Flush wood paneling.
   6. Interior door frames (jambs).

B. Related Sections: The following sections contain requirements that relate to this section:
   1. Division 6 Section "Rough Carpentry" for furring, blocking, and other carpentry work that is not exposed to view.
   2. Division 6 Section "Finish Carpentry" for carpentry exposed to view that is not specified in this section.

3. Division 6 Section “Exterior Architectural Woodwork” for exterior woodwork.
4. Division 8 Section “Flush Wood Doors” for door specified by reference to architectural woodwork standards.
5. Division 9 Section “Painting” for final finishing of installed painted finish architectural woodwork.

1.04 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product and process specified in this section and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

C. Fire-retardant treatment data for material impregnated by pressure process to reduce combustibility. Include certification by treating plant stating that treated materials comply with requirements.

D. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, devices, and other components.

E. Samples for initial selection purposes of the following in form of manufacturer’s color charts consisting of actual units or sections of units showing full range of colors, textures, and patters available for each type of material indicated.
   1. Plastic laminate (standard and premium selections).

F. Samples for verification purposes of the following:
   1. Lumber with or for transparent finish, 50 square inches, for each species and cut, finished on one side and one edge.
   2. Veneer leaves representative of and selected from flitches to be used for transparent finished woodwork.
   3. Wood veneer faced panel products; with or for transparent finish, 8-1/2 inches by 11 inches, for each species and cut with one half of exposed surface finished, with separate samples of unfaced panel product used for core.
   4. Lumber and panel products with factory-applied opaque finish, 8-1/2 inches by 11 inches for panels and 50 square inches for lumber, for each finish system and color, with one half of exposed surface finished.
   5. Laminate clad panel products, 8-1/2 inches, by 11 inches for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.

6. Corner pieces as follows:
    a. Cabinet front frame joints between stiles and rail as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
    b. Miter joints for standing trim.
7. Exposed cabinet hardware, one unit of each type and finish.

G. Product certificates signed by woodwork manufacturer certifying that products comply with specified requirements.

H. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

1.04 SUBMITTALS:

A. Manufacturer Qualifications: Firm experienced in successfully producing architectural woodwork similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Single-Source Responsibility: Arrange for production by a single firm of architectural woodwork with sequence matched wood veneers.
1. Include the veneering of wood doors in the single-firm production, where veneer matching extends across wood doors.

C. Single-Source Manufacturing and Installation Responsibility: Engage a qualified Manufacturer to assume undivided responsibility for woodwork specified in this section, including fabrication, finishing, and Installation.

D. Installer Qualifications: Arrange for installation of architectural woodwork by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this project.

E. AWI Quality Standard Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI) except as otherwise indicated.

F. Hardware Coordination: Distribute copies of approved schedule for cabinet hardware specified in Division 8 Section "Door Hardware" to manufacturer of architectural woodwork; coordinate cabinet shop drawings and fabrication with hardware requirements.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting, wet work, grinding, and similar operations that could damage, soil or deteriorate woodwork have been completed in installation areas. Woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions".

1.06 PROJECT CONDITIONS:

A. Environments Conditions: Obtain and comply with Woodwork Manufacturer's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of work.

PART 2 PRODUCTS

2.01 HIGH PRESSURE DECORATIVE LAMINATE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high pressure decorative laminates (standard and premium selections) which may be incorporated in the work include:

1. Formica Corp.
2. Nevamar Corp.
3. WilsonArt

2.02 MATERIALS:

A. General: Provide materials that comply with requirements of the AWI woodworking standard for each type of woodwork and quality grade indicated and, where the following products are part of woodwork, with requirements of the referenced product standards, that apply to product characteristics indicated:

1. Hardboard ANSI/AHA A135.4
2. High Pressure Laminate: NEMA LD 3.
3. Medium Density Fiberboard: ANSI A208.2
4. Particleboard ANSI A208.1
5. Softwood Plywood PS 1.

B. Formaldehyde Emission Levels: Comply with formaldehyde emission requirements of each voluntary standard referenced below:
1. Particleboard: NPA 8.
2. Medium Density Fiberboard: NPA 9.
3. Hardwood Plywood: HPMA FE.

C. Fire-Retardant Particleboard: Where indicated, provide panels complying with the following requirements that have fire-retardant chemicals bonded to softwood particles at time of panel manufacture to achieve products identical to those tested for flame spread of 20 or less and for smoke developed of 25 or less per ASTM B 84 by UL or other testing and inspecting organization acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.
1. For 45-lb-density panels and thicknesses of ¾ inch and less, comply with ANSI A208.1 for Grade 1-M-1 except that minimums for modulus of elasticity and screw-holding capacity on face and edge shall be 300,000 psi, 250 lb., and 225 lb., respectively.
2. For 44-lb-density panels and thicknesses of 13/16 inch to 1-1/4 inch, comply with ANSI A208.1 for Grade 1-M-1 except that minimums for modulus of rupture, modulus of elasticity, internal bond, linear expansion, and screw-holding capacity on face and edge shall be 1300 psi, 250,000 psi, 60 psi, 0.50 percent, 250 lb., and 175 lb., respectively.

2.03 FABRICATION, GENERAL:

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.

B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radium indicated for the following:
1. Corners of cabinets and edges of solid wood (lumber) members less than 1 inch in nominal thickness: 1/16 inch.
2. Edges of rails and similar members more than 1 inch in nominal thickness: 1/8 inch.

C. Complete fabrication, including assembly, finishing, and hardware application, before shipment to project site to minimum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Factory-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in-diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges of cutouts with a water-resistant coating.

2.04 FIRE-RETARDANT-TREATED LUMBER:

A. General: Where indicated, pressure impregnate lumber with fire-retardant chemicals of formulation indicated to produce materials with fire performance characteristics specified.

B. Fire-Retardant Chemicals: Use chemical formulations specified that do not b bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated lumber from untreated lumber.
   1. Organic: Resin-Based Formulation: Exterior type per AWPA C20 consisting of organic-resin solution, relatively insoluble in water, thermally set in wood by kiln drying.
   2. Low-Hygroscopic Formulation: Interior Type A per AWPA C20.

C. Fire Performance Characteristics: Provide materials identical to those tested for the following fire performance characteristics per ASTM test methods indicated by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify treated lumber with classification marking of inspection and testing organization in the form of separable paper label or where required by authorities having jurisdiction, of imprint on lumber surfaces that will be concealed from view after installation.
   1. Surface Burning Characteristics: Not exceeding values indicated below, tested per ASTM E84 for 30 minutes with no evidence of significant combustion.
      a. Flame Spread: 25.
      b. Smoke Developed: 50

D. Mill lumber after treatment, within limits set for wood removal that does not affect listed fire performance characteristics, using a woodworking plant certified by testing and inspecting organization.

E. Mill lumber before treatment and implement special procedures during treatment and drying processes that are needed to prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

F. Kiln-dry woodwork after treatment to levels required for untreated woodwork. Maintain moisture content required by kiln drying before and after treatment.

G. Discard treated lumber that does not comply with requirements of referenced woodworking standard. Do not use twisted, warped, bowed, discolored, or otherwise damaged or defective lumber.

H. Products: Subject to compliance with requirements, provide one of the following:
   1. Low-Hygroscopic Formulation (Type A):
      a. "Flameproof LHC"; Osmose Wood Preserving, Inc.
      b. "Dricon"; Hickson Corporation.

2.05 STANDING AND RUNNING TRIM AND RAILS FOR TRANSPARENT FINISH:

A. Quality Standard: Comply with AWI Section 300.

B. Backout or groove backs of flat trim members and kerf backs of other wide flat members, except for members with ends exposed in finished work.

C. Assemble casings in plant except where limitations of access to place of installation require field assembly.

D. Grade: Premium.

E. Lumber Species: Birdseye Maple, half round; and American Black Cherry, rift sawn.

2.06 STANDING AND RUNNING TRIM AND RAILS FOR OPAQUE FINISH:

A. Quality Standard: Comply with AWI Section 300.

B. Grade: Premium.

C. Backout or groove backs of flat trim members and kerf backs of other wide flat members, except for members with ends exposed in finished work.

D. Assemble casing in plant except where limitations of access to place of installation require field assembly.

E. Lumber Species: Any dosed-grain hardwood listed in referenced woodworking standard.

2.07 WOOD CABINETS (CASEWORK) FOR TRANSPARENT FINISH:

A. Quality Standard: Comply with AWI Section 400 and its Division 400A Wood Cabinets.

B. Grade: Premium.

C. AWI Type of Cabinet Construction: Flush overlay.

D. Wood Species for Exposed Surfaces: American Black Cherry, rift sawn.
   1. Grain Matching: Run and match grain vertically for drawer fronts, doors, and fixed panels.
   2. Matching of Veneer Leaves: Slip match.
   3. Veneer Matching Within Panel Face: Balance match.

E. Wood Species for Semi Exposed Surfaces: Match species and cut indicated for exposed surfaces.

2.08 LAMINATE CLAD CABINETS (PLASTIC COVERED CASEWORK):

A. Quality Standard. Comply with AWI Section 400 and its Division 400B "Laminate Clad Cabinets".

B. Grade: Premium.

C. AWI Type of Cabinet Construction: Flush overlay, unless otherwise indicated.

D. Laminate Cladding High pressure decorative laminate complying with the following requirements:
   1. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
      a. Provide selections made by Architect from laminate manufacturer's full range of standard and premium colors and finishes in the following categories:
         (1) Solid Colors
         (2) Patterns

2. Laminate Grade for Exposed Surfaces: Provide laminate cladding complying with the following requirements for type of surface and grade.
   a. Horizontal Surfaces other than Tops: GP-50 (0.050-inch nominal thickness).
   b. Vertical Surfaces: GP-50 (0.050-inch nominal thickness).
   c. Edges: GP-50 (0.050-inch nominal thickness).
3. Semi Exposed Surfaces: Provide surface materials indicated below:
   a. High pressure laminate, GP-28.

2.09 CABINET HARDWARE AND ACCESSORY MATERIALS:

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware".

B. Cabinet Hardware and Miscellaneous Item Schedule:
1. Adjustable Shelf Standard:
   a. Manufacturer/Model No: Knape & Vogt/No. 255
   b. Size/Type: 5/8" wide x 3/16" deep, recessed.
   c. Finish: Bright zinc plate.
   d. Remarks: ½" vertical adjustment.
2. Adjustable Shelf Support:
   a. Manufacturer/Model No.: Knape & Vogt/No. 256
   b. Finish: Bright zinc plate
   c. Remarks: For use with No. 255 standards.
3. Slotted Shelf Standard:
   a. Manufacturer/Model No.: Knape & Vogt/No. 51
   b. Size/Type: ¾" x 3/8" x length shown, surface mount, heavy duty.
   c. Finish: Bright nickel plate.
   d. Remarks: 1-5/8" – vertical adjustment
4. Adjustable Shelf Bracket:
   a. Manufacturer/Model No.: Knape & Vogt/No. 52
   b. Size/Type: 112" wide x shelf depth
   c. Finish: Bright nickel plate.
   d. Remarks: For use with No. 51 standards
5. Drawer Slide: (Typical)
   a. Manufacturer/Model No.: Grant/No. 329
   b. Size/Type: Full extension, length to suit drawer
   c. Finish: Zinc plate
   d. Remarks: 100 lb. rating
6. Drawer Slide: (To 4-1/2" drawer depth)
   a. Manufacturer/Model No.: Grant/No. 328
   b. Size/Type: Full extension, length to suite drawer

c. Finish: Zinc plate
d. Remarks: 50 lb. rating

7. Knobs (at Suites Level):
   a. Forms + Surfaces Model No. HC430 Series, sizes as selected by Architect from manufacturers standards.
   b. Finish: Anodized black matte
8. Wire Pulls:
   a. Manufacturer/Model No.: Stanely/No. 4483112
   b. Size/Type: 3-1/2" center wire pulls
   c. Finish: US 28D
9. Concealed Hinges:
   a. Manufacturer/Model No.: Stanley/No. 1510
10. Continuous Hinges:
    a. Manufacturer/Model No.: Stanley/No. STS311-1/4
    b. Size/Type: 1-1/2" wide x height of door
    c. Finish: US 32
    d. Remarks: Provide matching countersunk screws, 2" o.c., both sides
11. Door Catch (Magnetic Type)
    a. Manufacturer/Model No.: Stanley/No. SP4L
    b. Size/Type: 2" x 1-1/4" case size.
    c. Finish: Aluminum
    d. Remarks: One per leaf to 48", two per leaf to 84"
12. Cabinet Lock
    a. Manufacturer/Model No.: National/No. C-8053
    b. Size/Type: Disc tumbler cam lock
    c. Finish: US 26D or US 32D
    d. Remarks: Furnish two keys per lock; keyed to Building Standard
13. Sliding Glass Door Locks: K&V 965NP, keyed to building system
14. Track, Upper Guide & Sheaves: Stylmark Model No. 810005 Assembly, 204-Ri clear anodized finish.

C. Hardware Standard Comply with ANSI/BEMA A156.9 "American National Standard for Cabinet Hardware" for items indicated by reference to BIIMA numbers or referenced to this standard.

D. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for BHMA code number indicated.
   1. Dark Oxidized Satin Bronze, Oil Rubbed, on Bronze Base: BHMA 613 and matching Architect's sample.
   2. Satin Chromium Plated, Brass or Bronze Base: BHMA 626.
   3. Satin Chromium Plated, Steel Base: BHMA 652.
   4. Satin Stainless Steel, Stainless Steel Base: BHMA 630

E. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements of ANSJ/BHMA A156.9.

F. Clear Tempered Float Glass for Shelves: ASTM C 1048, Condition A, style I, type I, quality q3, class 1, seamed at edges before tempering, ¼-inch thick unless otherwise indicated.

2.10 ARCHITECTURAL CABINET TOPS (COUNTERTOPS):

A. Quality Standard: Comply with AWI Section 400 and its Division 400C.

B. Type of Top: High pressure decorative laminate complying with the following:
   1. Grade: Custom
   2. Laminate Cladding for Horizontal Surface: High pressure decorative laminate as follows:
      a. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements.
         (1) Provide selections made by Architect from manufacturer's full range of standard and premium colors and finishes in the following categories.
            (a) Solid colors
            (b) Patterns
      b. Grade: GP-50 (0.050-inch nominal thickness).
      c. Edge Treatments:
         (1) Plastic Laminate Edge Treatment: Same as laminate cladding on horizontal surfaces.
         (2) Wood Edge Treatment: Lumber edge for transparent finish, with matching wood species and cut to be determined.

2.11 FLUSH WOOD PANELING FOR TRANSPARENT FINISH:

A. Quality Standard: Comply with AWI Section 500 and its Division 500A.

B. Grade: Premium

C. Veneer Species: Birdseye Maple1 half round; and American Black Cherry, rift sawn.

D. Matching of Adjacent Veneer Leaves: Slip match.

E. Veneer Matching within Panel Face: Balance match.

F. Fire Performance Characteristics: Provide paneling composed of panels of wood veneer density and fire-retardant particleboard that are identical in construction to units tested for the following surface burning characteristics per ASTM E 84 by UL or other testing and inspecting organization acceptable to authorities having jurisdiction. Identify panels with appropriate markings of applicable testing and inspecting organization on surfaces that will be concealed from view after installation.
   1. Flame Spread: 75 or less
   2. Smoke Developed: 40 or less

2.12 INTERIOR DOOR FRAMES FOR TRANSPARENT FINISH:

A. Quality Standard: Comply with AWI Section 900B.

B. Grade: Premium

C. Lumber Species: American Black Cherry, rift sawn

2.13 CLOSET AND UTILITY SHELVING:

A. Quality Standard: Comply with Section 600

B. 1. Grade: Economy
   2. Shelving Material: Birch faced veneer core plywood
   3. Lumber: Ponderosa Pine or Poplar

2.14 FASTENERS AND ANCHORS:

A. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.
   1. For metal framing supports, provide screws as recommended by metal framing manufacturer.

B. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

C. Anchors: Select material, type, size and finish required by each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

2.15 FACTORY FINISHING OF INTERIOR ARCHITECTURAL WOODWORK:

A. Quality Standard: Comply with AWI Section 1500 unless otherwise indicated.

B. General: The entire finish of interior architectural woodwork is specified in this section, regardless of whether factory applied or applied after installation.
   1. Factory Finishing: To the greatest extent possible, finish architectural woodwork at factory. Defer only final touch-up, cleaning, and polishing until after installation. Painted finish by Section 099100 except prime coat.

C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.

D. Transparent Finish for Closed-Grain Woods: Comply with requirements indicated below for grade, finish system, staining, effect, and sheen.
   1. Grade: Premium
   2. AWI Finish System #5: Catalyzed polyurethane
   3. Staining for Cherry Only: Match approved sample for color
   4. Effect: Open grain (not filled).
   5. Sheen: Dull satin 15-20 deg.

E. Opaque Finish: Comply with requirements indicated below for grade, finish system, color, effect, and sheen:
   1. Grade: Premium
   2. AWI Finish System #11: Catalyzed polyurethane
   3. Color: Match Architect's sample
   4. Sheen: Medium-gloss rubbed effect 35-45 deg

2.16

PART 3 EXECUTION

3.01 PREPARATION:

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Deliver concrete inserts and similar anchoring devices to be built into substrates well in advance of time substrates are to be built.

C. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.02 INSTALLATION:

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for same grade specified in Part 2 of this section for type of woodwork involved.

B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 118 inch in 8'-0" for plumb and level (including tops) and with no variations in flushness of adjoining surfaces.

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with recommendations of chemical treatment manufacturer including those for adhesives where are used to install woodwork.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

F. Standing and Running Trim and Rails: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns and miter at corners.

G. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory item as indicated. Maintain veneer sequence matching (if any) of cabinets with transparent finish.

H. Tops: Anchor securely to base units and other support systems as indicated.

I. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips and by blind nailing on backup strips, splined-

connection strips, and similar associated trim and framing. Do not face nail unless otherwise indicated.

J. Complete the finishing work specified in this section to whatever extent not completed at shop or before installation of woodwork.

K. Refer to the Division 9 sections for finishing of painted architectural woodwork.

3.03 ADJUSTMENT AND CLEANING:

A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.04 PROTECTION:

A. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer, which ensure that woodwork is being without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 076000 – SHEET METAL AND MISCELLANEOUS ACCESSORIES

PART 1 GENERAL

1.01 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.02 SUMMARY:

A. Section Includes:
   1. Provide flashing and sheet metal components for moisture protection.
   2. Related accessories.

1.03 SUBMITTALS:

A. Product Data:
   1. Submit shop drawings, product data and mockups of all sheet metal.

1.04 QUALITY ASSURANCE:

A. Comply with governing local, state, and federal regulations, safety standards, and codes. Provide products of acceptable manufacturers in satisfactory use in similar service for five years. Use experienced installers. Deliver, handle and store materials in accordance with manufacturer's instructions.

B. Reference Standards: Applicable portions of SMACNA, ASTM and NAAMM publications.

1.05 WARRANTIES:

A. Manufacturer's Product Warranty: Submit manufacturer's standard limited product warranty signed by the manufacturer's authorized official, guaranteeing to correct failures in product which may occur during the warranty period, without reducing or otherwise limiting any other rights to correction which the Owner/Project Consultant may have under the contract documents. Failure is defined to include product failure which leads to interruption of a watertight installation. Correction may include repair or replacement of failed product.

B. Contractor's Warranty period: For roofing flashing and sheet metal, provide a written warranty which shall warrant work to be free of leaks and defects in materials and workmanship for two (2) years, starting from date of substantial completion.

C. Defects of the sheet metal occurring during the warranty period shall be promptly corrected by the contractor, and defects of the roofing shall be promptly corrected by the manufacturer at no additional cost to the Owner. Upon notification from the Owner or the Owner's representative that evidence of a defect exists, the responsible party shall immediately inform the Owner's representative of the date on which corrective work will be scheduled, and shall notify the Owner's representative when the corrective work has been completed.

PART 2 PRODUCTS

2.01 SHEET METAL MATERIAL:

A. Hot-dipped Galvanized Steel for use as counter flashings (where not visible from the ground), pitch pans and expansion joints: Minimum 24-gauge, G-90, hot-dipped galvanized metal, commercial quality, ASTM A 525.

B. Hot-dipped Galvanized Steel for use as continuous clips: Minimum 22-gauge, G-90, hot-dipped galvanized metal, commercial quality, ASTM A 525.

C. Prefinished Galvanized Sheet Steel (where visible from the ground): Shall be 24-gauge flat stock, prefinished with Kynar finish meeting ASTM A 446, forty-five and one-half inches to forty-eight inches width by one hundred twenty inches in length (45-1/2" – 48" x 120") for use as new metal edge gravel guard, cover plates, downspouts, gutters, coping and miscellaneous metal. Standard color to be selected by Owner/Project Consultant.

D. Stainless Steel: QQ-S-766, Class 301, 302, 304, or 316; or ASTM A 167, Type 301, 302, 304, or 316: form and condition most suitable for the purpose.

E. Aluminum and Aluminum Alloy Plate and Sheet: QQ-A-250; form, alloy, and temper shall be that most suitable for the purpose.

F. Sheet Lead: QQ-L-201, Grade B.

G. All existing sheet metal shall be replaced with new metal of like gauge and type, or as specified on drawings.

2.02 FASTENERS:

A. Fasteners shall be same metal as flashing/sheet metal, or other non-corrosive metal as recommended by sheet manufacturer for the specific application. Match finish of exposed heads with material being fastened.

B. Fasteners and fastening plates or bars shall be listed in the FM Global Approved Guide.

C. Fastener for Brick: Shall be one-fourth inch by two inches (1/4" x 2"), zinc with plated steel or stainless steel nail, one piece unit, and flat head.

D. Screws: Self-taping sheet metal type with neoprene washer, as appropriate.

E. Pop Rivets: Full stainless steel Series 42 or 44, as appropriate.

F. Continuous Clip: Concealed hold-down clip type; of same materials as coping, gravel guard, sized to suite application. Use a continuous clip, minimum 22-gauge G-90 galvanized.

2.03 RELATED MATERIAL:

A. Bituminous Paint: Acid and alkali resistant, black color.

B. Plastic Cement: FS SS-C-153, cutback asphalt type.

C. Solder: QQ-S-571 composition best suited for purpose; use high tin content, minimum 60/40, for stainless steel and Monel alloy.

D. Copper, Sheet, and Strip: QQ-C-576, ASTM B 370, light cold-rolled temper.

E. Lead-coated Copper: ASTM B 101, Type I or II, Class A.

F. Sealant (for Sheet Metal): One-component polyurethane, conforming to requirements of FS TT-S-230C, non-staining and non-bleeding.

2.04 FABRICATION – GENERAL:

A. Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer's instructions and recommendations. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels as indicated, with exposed edges folded back to form hems.

B. Fabricate gravel stops/fascia, gutters/downspouts, counter flashings, pitch pans, expansion joints, and copings with new galvanized sheet metal as specified. Fabricate gravel guard and fascia to size and dimensions as indicated on the drawings. Fabricate light metal coping, gutters and downspouts as indicated.

C. Form sheet metal on bending brake.

D. Shape, trim and hand seam metal on bench insofar as practicable.

E. Form materials with straight lines, sharp angles and smooth curves.

F. Fold back edges on concealed side of exposed edge to form hem (1/2" minimum).

G. Weld or solder joints on parts that are to be permanently and rigidly assembled.

H. Submit sheet metal models for approval by the Owner/Project Consultant.

I. Limit single-piece lengths to ten feet (10”).

J. Fabricate corner pieces with eighteen inch (18”) extensions, metered and sealed by forming as one piece.

K. Surface sand flange prior to applying any primers on Kynar metal.

L. Backpaint flashing in contact with masonry or dissimilar materials with bituminous paint.

M. All sheet metal shall be sealed and watertight.

N. Metal work should be secured so as to prevent damage from buckling or wind. Where clips are shown, these are to be continuous.

O. All metal to receive bitumen or adhesive shall be first primed with asphalt primer.

P. All prefinished metal shall be sanded and/or abraded prior to receiving primer.

Q. Seams: Fabricate non-moving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges are to be seamed, form seams, and soldered.

R. Expansion Provisions: Form expansion joints of intermeshing hooked flanges, not less than one inch (1”) deep, filled with mastic sealant (concealed within joints).

S. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with industry standards.

T. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

U. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

2.05 FINISH:

A. Backpaint concealed metal surfaces with bituminous paint where expected to be in contact with cementitious materials or dissimilar metals. Exposed surfaces to be provided with a factory applied fluorocarbon Kynar finish meeting ASTM A 446 and AAMA specification 605.2 for high performance coating.

B. New 24-gauge hot-dipped galvanized metal shall be painted on all locations visible from the ground with an industrial grade paint to match existing, or standard color selected by Owner/Project Consultant. Galvanized metal surface must be properly prepared by removing all oil, grease, and/or protective mill coatings by solvent cleaning surface in accordance with SSPC-SPI, and according to paint manufacturer's recommendation, to ensure proper adhesion of paint to metal.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify roof openings, curbs, pipes, sleeves, ducts or vents through roof are solidly set, cant strips and reglets in place, substrates are smooth and clean and nailing strips located.

B. Verify membrane termination and base flashings are in place, sealed and secure.

C. Beginning of installation means acceptance of conditions.

3.02 PREPARATION:

A. Field measure site conditions prior to fabricating work. Provide all shop drawings and mock-ups one month prior to installation to the Owner/Project Consultant for approval.

B. Install starter and edge strips and cleats before starting installation.

3.03 INSTALLATION:

A. General: All sheet metal termination to vertical wall shall have a through-wall with receiver installed on masonry walls or prefabricated "Z" bar flashing pre-installed to fluid applied wall finished prior to installation of sheet metal termination. This applies to edge metal, base flashing closures and all vertical surface intersections. Refer to NRCA, SMACNA, and metal manufacturer's guidelines.

B. Gravel Guard/Fascia:
   1. Shall be installed with expansion joints, ten feet (10') on center, one-fourth inch (1/4") expansion leeway, with a cover plate.
   2. Secure metal flashings per specifications.
   3. Lock seams and end joints.
   4. Form sections identical to profiles as shown or approved similar, to match existing building.
   5. Fabricate corner pieces with minimum eighteen inch (18"), maximum forty-eight inch (48") extensions, formed and sealed with rivets and sealant, as one piece.
   6. Hem exposed edges three-fourths inch (3/4") minimum.
   7. Backpaint flashing in contact with masonry or dissimilar materials with bituminous.
   8. Integrate flashing in a manner consistent with detailing.
   9. Provide and install continuous clip around perimeter.
   10. Shall be fabricated in accordance with all SMACNA provisions.

C. Coping:
   1. All coping shall be manufactured with low profile standing seam metal.
   2. Shall be minimum 24-gauge prefinished Kynar installed in ten foot (10') sections maximum with cover plates.
   3. Vertical fascia shall extend minimum two and one-half inches (2-1/2") or be minimum one and one-half inches (1-1/2") below bottom of nailer, whichever is greater.
   4. Secure metal flashings per specifications.
   5. Lock seams and end joints.
   6. Form sections identical to profiles as shown or approved similar, to match existing building.
   7. Fabricate corner pieces with minimum eighteen inch (18"), maximum forty-eight inch (48") extensions, formed and sealed with rivets and sealant, as one piece.
   8. Hem exposed edges three-fourths inch (3/4") minimum.
   9. Backpaint flashing in contact with masonry or dissimilar materials with bituminous paint. Surface sand before applying primers.
   10. Integrate flashing in a manner consistent with detailing.
   11. Provide and install continuous clip, minimum 22-gauge.

12. Shall be fabricated in accordance with all SMACNA provisions.

D. Expansion Joint Field and at Wall:
   1. Shall be as outlined details, and be in full compliance with all provisions of SMACNA and FM Global requirements for attachment, installation and recommendations.
   2. Secure metal flashings per specifications.
   3. Lock seams and end joints
   4. Form sections identical to profiles as shown or approved similar, to match existing building.
   5. Fabricate corner pieces with minimum eighteen inch (18”), maximum forty-eight inch (48”) extensions, formed and sealed with rivets and sealant, as one piece.
   6. Hem exposed edges three-fourths inch (3/4”) minimum.
   7. Backpaint flashing in contact with masonry or dissimilar materials with bituminous paint. Surface sand before applying primers.
   8. Integrate flashing in a manner consistent with detailing.
   9. Provide and install continuous clip around perimeter.
   10. Shall be fabricated in accordance with all SMACNA provisions.

E. Counterflashing:
   1. Saw cut brick mortar joint to receive friction fit reglet and removable counterflashing as detailed and SMACNA Figure 4-3E.

F. Gutter and Downspout:
   1. Fabrication:
      a. Fabricate gutter and downspout of profile and size indicated.
      b. Field measure site conditions prior to fabricating work.
      c. Fabricate with required connection pieces.
      d. Fabricate section square, true, and accurate in size, in maximum possible lengths and free of distortion or defects detrimental to appearance or performance.
      e. Hem exposed edges of metal.
      f. Form and seal all metal joints; provide for expansion joints per SMACNA.
   2. Installation:
      a. Install collector head, downspout, and accessories.
      b. Join lengths with seams pop riveted and sealed watertight. Flash and seal collector head to downspout and accessories.
      c. Seal all metal joints watertight for full metal surface contact.
      d. Collector Head: SMACNA style profile; submit detail for approval.
      e. Downspouts: Rectangular profile. Seal all joints, four inches by six inches (4” x 6”).

f. Support Brackets, Joint Fasteners: Profiled to suit gutters and downspouts.
g. Anchorage Devices: SMACNA requirements. Type recommended by fabricator.
h. Collector Head Support: Kynar. Color and Finish matching, as recommended by SMACNA.
I. Downspout Supports: Straps, Kynar. Color and Finish to match.

G. Overflow Scupper, Collector Head and Downspout:
1. Fabrication:
a. Fabricate overflow scupper, collector head and downspout of profile and size indicated, taking care that the roof drain leader fits properly into the back of the collector head. Seal the pipe to the collector head for water tightness.
b. Field measure site conditions prior to fabricating work.
c. Fabricate with required connection pieces.
d. Fabricate section square, true, and accurate in size, in maximum possible lengths and free of distortion or defects detrimental to appearance or performance.
e. Hem exposed edges of metal.
f. Form and seal all metal joints; provide for expansion joints per SMACNA.
2. Installation: Install collector head, downspout, and accessories.
a. Join lengths with seams pop riveted and sealed watertight. Flash and seal collector head to downspouts and accessories.
b. Seal all metal joints watertight for full metal surface contact.
c. Collector Head: SMACNA style profile; submit detail for approval.
d. Downspout: Rectangular profile. Seal all joints, four inches by six inches (4” x6”).
e. Support Brackets, Joint Fasteners: Profiled to suit gutters and downspouts.
f. Anchorage Devices: SMACNA requirements. Type recommended by fabricator.
g. Collector Head Support: Kynar. Color and Finish to match, as recommended by SMACNA.
h. Downspout Supports: Straps, Kynar. Color and Finish to match.

H. Pitch Pans:
1. Install pitch pans of 24-gauge galvanized steel according to NRCA standards, minimum of six inches by six inches (6” x 6”).

2. Pitch pans shall be fabricated to minimum of four inches (4") above the finished roof membrane. Seams of pitch pans shall be soldered.
3. Mastic shall be applied under pitch pan flange a minimum of one-half pound (1/2#) per linear foot.
4. All metal flanges shall be primed with asphalt primer prior to flashing installation. Inside of pitch pan shall be cleaned and primed as required by pitch pan sealant manufacturer.
5. All projections enclosed in pitch pans shall be cleaned in any manner suitable and coated with a rust inhibitive coating as approved by the Owner/Project Consultant. Coating shall be allowed to dry prior to pitch pan fill.
6. Base of pitch pans shall be filled with grout or cementitious binder to proper height and allowed to cure.
7. Top finish fill shall be self-leveling, one-part urethane, with maximum fill to within three-eighths inch (3/8") of top of pitch pan sides.
8. Strip metal flange of pitch pan with one strip of Type IV fiberglass felt set in hot bitumen extending from the outer edge of the flange a minimum of three inches (3") inward to base of pitch pan.
9. Strip in fiberglass felt with .060 inch coal-tar elastomeric membrane flashing set in hot asphalt extending from the outer edge of the Type IV fiberglass underlayment a minimum of three inches (3") inward to the base of the pitch pan.

I. Bonnets/Hoods:
1. Fabricate and install above all pitch pans, where necessary, or reinstall as applicable, metal bonnets over all pitch pans, NO EXCEPTIONS.
2. Bonnets/Hoods shall be manufactured with metal compatible with metal to which bonnet is to be attached.
3. On beams and other steel, weld in place bonnets fabricated from one-fourth inch 1/4") steel plate.
4. Draw band bonnets fabricated from 22-gauge galvanized steel may be used on circular projections.

3.04 FINISH:

A. Backpaint concealed metal surfaces with bituminous paint where expected to be in contact with cementitious materials or dissimilar metals. Exposed surfaces to be provided with a factory applied fluorocarbon Kynar finish meeting ASTM A 446 and AAMA specification 605.2 for high performance coating.

END OF SECTION

SECTION 081000 – WOOD DOORS AND FRAMES

PART 1 GENERAL

1.01 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.02 GENERAL REQUIREMENTS:

A. Any door shown on the floor plans but not specifically referenced in the door schedule shall be provided as identical to a similar opening and shall be included in the wood door supplier's base bid.

B. All fire rated doors shall be provided to comply with the local code requirements whether drawn that way or not as part of the hollow metal supplier's base bid.

1.03 SUMMARY:

A. Section Includes:
   1. Solid-core doors and transom panels with wood-veneer, hardboard or MDF and decorative-laminate faces (standard and premium selections).
   2. Factory finishing wood doors.
   3. Factory fitting wood doors to frames and factory machining for hardware.

4. Factory fitting wood frames to doors and factory machining for hardware.

B. Related Sections:
1. Division 8 Section “Steel Doors and Frames” for hinge and lock locations and astragals provided as part of a fire-rated labeled assembly.
2. Division 8 Section “Finish Hardware” for hardware preparations.
3. Division 8 Section “Glazing” for glass view panels in wood doors.

1.04 SUBMITTALS:

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire-protection ratings for fire-rated doors.

C. Samples for Initial Selection: Provide finish samples for decorative-laminate door faces from manufacturer’s standard and premium selections.

D. Samples for Verification: Provide upon submission of submittals.
1. Decorative-laminate, 8” x 10”, for each color, and pattern selected from standard and premium selections.
2. Corner sections of doors, approximately 5” x 11” for decorative laminate doors, with door faces and edges representing actual materials to be used.
a. Provide samples for each color, and pattern of decorative-laminate required from manufacturer’s standard and premium selections.
3. Louver blade and frame sections, 6 inches long, for each material and finish specified.
4. Frames for light openings, 6 inches long, for each material, type, and finish required.

E. Warranty: Sample of special warranty.

1.05 QUALITY ASSURANCE:

A. Source Limitations: Obtain wood doors from single manufacturer wherever possible.
B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors".

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
   1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies provide manufacturer's construction label, indicating compliance to independent 3rd party certification agency's procedure, except for size.
   2. Temperature-Rise Limit: Where indicated, provide doors that have a maximum transmitted temperature end point of not more than 250 degrees F above ambient after 30 minutes of standard fire-test exposure.

D. Pre-Installation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING:

A. Comply with requirements of referenced standard and manufacturer's written instructions.
B. Package doors individually in plastic bags or cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top rail with opening number used on Shop Drawings.

1.07 PROJECT CONDITIONS:

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.08 WARRANTY:

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
      b. Telegraphing of core construction in wood face veneers exceeding 0.01 inch in a 3-inch span.
      c. Telegraphing of core construction and delamination of face in decorative laminate-faced doors.
   2. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 PRODUCTS

2.01 DOOR CONSTRUCTION, GENERAL:

A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

B. Structural-Composite-Lumber-Core Doors:
   1. Structural Composite Lumber: WDMA I.S.10.
      a. Screw Withdrawal, Face: 700 lbf (3100 N).
      b. Screw Withdrawal, Edge: 400 lbf (1780 N).

C. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
   1. Edge Construction: Provide 45, 60 and 90 minute fire-rated doors edge construction with intumescent seals concealed by outer stile (Category A). Comply with specified requirements for exposed edges.
   2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

2.02 DECORATIVE-LAMINAE FACED DOORS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Graham
   2. Marshfield
   3. VT Industries
   4. Egges
   5. Algoma

B. Low-Pressure Decorative Laminate Faces:
   1. Low-pressure decorative laminates faces thermally fused to cores under heat and pressure, complying with Laminating Materials Association's Product Standard and Typical Physical Properties of Decorative Overlays. LMA.2003.
   2. Color or Wood Grain Pattern: As selected by Engineer from Wilsonart or Formica standard and premium laminates.
   3. Exposed Edges: Impact-resistant polymer edging, minimum .040" thick, applied to all four edges after faces.
      a. Polymer Edging Color or Wood Grain Pattern: Same as faces.
   4. Provide doors with pilot holes factory-drilled for vertical edge hinges and lock sets.
   5. Core: Particleboard type M-2.

C. High-Pressure Decorative Laminate Faces:
   1. Grade: Premium.
   2. Plastic-Laminate Faces: High-pressure decorative laminates complying with NEMA LD 3, Grade HGS.
   3. Color or Wood Grain Pattern: As selected by Engineer from Wilsonart or Formica standard and premium laminates.
   4. Exposed Edges: Impact-resistant polymer edging, applied to all four edges after faces.
      a. Polymer Edging Color or Wood Grain Pattern: Same as faces.
   5. Provide doors with pilot holes factory-drilled for vertical edge hinges and lock sets.
   6. Core: Structural composite lumber.
   7. Construction: Stiles and rails are bonded to core, then entire unit abrasive planed before faces and crossbands are applied.

2.03 LOUVERS AND LIGHT FRAMES:

A. Metal Louvers:
   1. Blade Type: Vision-proof inverted V or inverted Y.
   2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked-enamel or powder-coated finish.

B. Louvers for Fire-Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire-protection rating of 1-1/2 hours and less.
   1. Manufacturers: Subject to compliance with requirements, provide door manufacturers standard louver to meet rating indicated.
   2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked-enamel or powder-coated finish.

C. Metal Frames for Light Openings in Fire-Rated Doors over 20-minute rating: Manufacturer's standard frame formed of 0.048-inch thick, cold-rolled steel sheet; with baked-enamel or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

2.04 FABRICATION:

A. Factory fit door to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
   1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Electrical Raceways: Provide rewired raceways with standardized plug connectors to accommodate up to twelve (12) wires as required for electrified door hardware specified in hardware sets in Division 8 Door Hardware. Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Wire nut connections are not acceptable.

C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
   1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining
   2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

D. Openings: Cut and trim openings through doors in factory.
   1. Light Openings: Trim openings with moldings of material and profile indicated.

PART 3 EXECUTION

3.01 EXAMINATION:

A. Examine doors and installed door frames before hanging doors.
   1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
   2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION:

A. Hardware: For installation, see Division 8 Section “Door Hardware”.

B. Installation Instructions: Install doors to comply with manufacturer’s written instructions and the referenced quality standard, and as indicated.
   1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at project site.

3.03 ADJUSTING:

A. Operation: Re-hang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 081516 – SOLID PLASTIC DOORS (RESTROOM TOILET COMPARTMENTS)

PART 1 GENERAL

1.01 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.02 GENERAL REQUIREMENTS:

A. Any Restroom toilet compartment door shown on the floor plans but not specifically referenced in the door schedule shall be provided as identical to a similar opening and shall be included in the plastic door supplier's base bid.

1.03 SUMMARY:

A. Section Includes:
1. Solid-plastic toilet compartment doors and hardware.

1.04 SUBMITTALS:

A. Product Data: For each type of door indicated. Include construction details, materials descriptions, dimensions of individual components and profiles, and finishes for toilet compartment doors.

B. Sustainable Design Submittals:

1. Product Dada: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
   1. Indicate dimensions and locations of mortises and holes for hardware.
   2. Indicate dimensions and locations of cutouts.
   3. Indicate doors to be factory finished and finish requirements.

D. Samples for Initial Selection: Provide samples of door material, including color selection, and hardware or other required accessories.

E. Samples for Verification: Provide upon submission of submittals.
   1. Each type of material, color, and finish required for toilet compartment doors, 6 inch square Samples of same thickness and material indicated for Work.
   2. Each type of hardware and accessory.
   3. Hinges: Stainless steel partition continuous hinge.

F. Warranty: Sample of special warranty.

G. Closeout Submittals
   1. Maintenance Data: For toilet compartment doors, to include maintenance manuals.

H. Maintenance Material Submittals.
   1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents and source.
      a. Door Hinges: Three hinges with associated fasteners.
      b. Latch and Keeper: Three latches and keepers with associated fasteners.
      c. Door Bumper: Three bumpers with associated fasteners.
      d. Door Pull: Three door pulls with associated fasteners.
      e. Fasteners: Ten fasteners of each size and type.

1.05 QUALITY ASSURANCE:

A. Source Limitations: Obtain plastic doors from single manufacturer.

B. Pre-Installation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING:

A. Comply with requirements of manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Indicate opening number for each door as used on Shop Drawings.

1.07 PROJECT CONDITIONS:

A. Field Measurements: Verify actual locations of toilet compartment doors by field measurements before fabrication.

1.08 WARRANTY:

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS:

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

B. Recycled Content: Postconsumer recycled content plus on-half of preconsumer recycled content not less than 25 percent.

C. Regulatory Requirements: Comply with applicable provisions in the 2012 Texas Accessibility Standards and ICC A117.1 for toilet compartments designated as accessible.

2.02 SOLID-PLASTIC TOILET COMPARTMENT DOORS:

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. American Sanitary Partition Corporation.

2. Bradley Corporation.
3. Global Partitions; ASI Group.
4. Scranton Products.

B. Door Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
   1. Integral Hinges: Configure doors and CMU pilasters to receive integral hinges.
   2. Color and Pattern: In each room as selected by Architect from manufacturer's full range.

2.03 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.
   1. Material: Stainless steel.
   2. Hinges: Manufacturer's standard continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door.
   3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for use with CMU pilaster. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
   4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
   5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
   6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
   1. Material: Stainless steel.
   2. Hinges: Manufacturer's heavy-duty continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door.
   3. Latch and Keeper: Manufacturer's heavy-duty surface-mounted latch unit designed for use with CMU pilaster. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.

4. Coat Hook: Manufacturer's heavy-duty combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
5. Door Bumper: Manufacturer's heavy-duty rubber-tipped bumper at out-swinging doors.
6. Door Pull: Manufacturer's heavy-duty unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

2.04 FABRICATION:

A. Fabrication, General: Fabricate toilet compartment doors to sizes indicated.

PART 3 EXECUTION

3.01 EXAMINATION:

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION:

A. General: Comply with manufacturer's written installation instructions. Install units straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

3.03 ADJUSTING:

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION

SECTION 107516 – FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

A. Sections include flagpoles and accessories.
B. Related Sections:
   1. Section 033000 – Cast in Place Concrete: Concrete base and foundation construction.

1.2 REFERENCES

A. American Society for Testing and Materials:
   1. ASTM A53 – Standard Specification for Pipe, Steel. Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   2. ASTM A 1 23/A 123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   3. ASTM A312/A312M – Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes.
   4. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   5. ASTM B241/B241M – Standard Specifications for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.

1.3 PERFORMANCE REQUIREMENTS

A. Flagpole with Flag Flying: Resistant without permanent deformation to 110 miles/hr. wind velocity; non-resonant, Safety design factor of 2.5.
B. Flagpole Without Flag: Resistant without permanent deformation to 110 miles/hr. wind velocity; non-resonant safety design factor of 2.5.

1.4 SUBMITTALS

A. Submittal Procedures: Submittal procedures.
B. Shop Drawings: Indicate detailed dimensions, base attachment details, anchor requirements, and imposed.
C. Product Data: Submit data on pole, accessories, and configurations.
D. Samples: Submit two 2 x 2 inch in size illustrating pole material, color, and finish.

1.5 CLOSEOUT SUBMITTALS

A. Execution Requirements: Closeout procedures.

B. Operation and Maintenance Data: Submit Operation and Maintenance Data.

1.6 QUALIFICATIONS

A. Design flagpole foundation and supports under direct supervision of Professional Engineer experienced in design of this work and licensed in State of Texas.

1.7 DELIVERY, STORAGE, AND HANDLING

Section 016000 – Product Requirements: Product storage and handling requirements.

A. Spiral wraps flagpoles with protective covering and pack in protective shipping tubes or containers.
B. Protect flagpoles and accessories from damage or moisture.

PART 2 - PRODUCTS

2.1 FLAGPOLES

A. Manufacturers:
   1. Eder Flag Inc., Vanguard Series (Internal Halyard) Bronze Finish,
      1-Model ECV30 ITEM # 320449
      2-Model ECV35 ITEM # 320453
      (Available at www.flagpolewarehouse.com)

2.2 COMPONENTS

A. Aluminum: ASTM B241fB241M, ASTM B221.
   6063 alloy, T6 temper.
B. Nominal Height: 30 ft.; measured from nominal ground elevation.
C. Flagpole: Ground mounted type.
D. Flagpole Design: Cone style.
E. Halyard: Internal halyard type.

2.3 ACCESSORIES

A. Truck Assembly: Cast aluminum revolving truck.
B. Flags: To be provided by Owner.
C. Cleat Box: Built-in, lockable.
D. Halyard: 5/16 inch diameter polypropylene, braided, white; with 4 chrome plated bronze swivel snap hooks.

E. Operator: Controls – Internal cam cleat
F. Foundation Tube Sleeve: AASHTO M36
Corrugated 16 gauges galvanized. Depth as indicated on Drawings.
G. Pole Base Attachment: Flush aluminum base with base cover.
H. Lighting Ground Rod: 12 inch long copper rod, ¾ inch diameter.

2.4 FACTORY FINISHING

A. Metal Surfaces in Contact with Concrete: Asphaltic paint.
B. Concealed Steel Surfaces: Galvanized to ASTM A123/A123M 1.25 oz/sq ft.
C. Exposed to View Steel Surfaces: Galvanized to ASTM A123/A123M 1.2 oz/sq ft. Field painted, color as selected by Owner/SSP.
D. Aluminum: Anodized mill finish-silver color or as selected by Owner/SSP
E. Finial: Bronze Anodized finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify concrete foundation is read to receive work and dimensions are as indicated on shop drawings and as instructed by manufacturer.

3.2 PREPARATION

A. Coat metal sleeve surfaces below grade, in contact with cementitious surfaces, and in contact with dissimilar metals with asphaltic paint.

3.3 INSTALLATION

A. Fill foundation tube sleeve with concrete and sand as specified and compact.
B. Install foundation plate and centering wedges for flagpoles base set in concrete base and fasten.

3.4 ERECTION TOLERANCES

A. Quality, Requirements: Tolerances
B. Maximum Variation from Plumb: 1 inch

3.5 ADJUSTING

A. Execution Requirements: Testing, adjusting, and balancing.
B. Adjust operating devices so halyard and flag function smoothly.

3.6 CLEANING & PROTECTION

A. At completion of installation, clean all soiled surfaces in accordance with manufacturer's instructions.
B. Protect from damage during the course of construction and until final acceptance.

END OF SECTION

SECTION 115800 - INFIELD FOR BASEBALL/SOFTBALL FIELDS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide infield mix materials.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Infield

1. "Red Infield Dirt". This material shall be a read sandy clay loam mixture. All of the soil used in the skinned area shall pass through a 3/8 inch wide screen. A minimum of 97% should pass through a number 8 sieve, and of the remaining 97%, at least 60% should pass through a number 140 sieves. To be approved by Engineer prior to installation. Submittal required.

Infield Gradation

Soil	%
Sand	60% - 80%
Silt	10% - 20%
Clay	15% - 20%

2. Infield Conditioner:
"Diamond Pro Red Infield Conditioner" or approved Substitution.
3. Infield Top Dressing:
"Diamond Pro Calcined Clay Top Dressing" or approved substitution.

B. Home Plate and Pitchers Circle: Batter's box, catcher's box and pitchers circle shall be a screened clay loam with a rich red color. Mixture of sand, silt and clay shall be in approximate equal retained percentage proportions. Use "Diamond Pro Home Plate/Mound Clay" or approved equivalent material.

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide written verification that infield Sub-grade and Sub-grade Drains are in place and properly compacted, and to grade before proceeding with installation of infield and warning track materials.

3.2 INSTALLATION

A. Infield:
   1. Turf Contractor shall have laid out the skinned infield, excavated the area to Subgrade elevations, and installed wooden form boards on all dirt perimeters prior to installation of the infield materials.
   2. Infield: Red Infield dirt material shall be back dumped onto the Subgrade and spread by track mounted tractor to a thickness of 4-1/2" (compacted). The red infield dirt shall be graded using automated hydraulically actuated laser guided equipment. Compact topping material by thoroughly wetting.
   3. Infield Conditioner: After infield material is compacted in place and to grade, infield conditioner 1-1/2" thick (compacted) shall be applied to the 4-1/2" of infield material. Thoroughly blend the total 6" of Red infield dirt and Infield Conditioner and compact. The infield should then be screen dragged to game ready conditions. The infield should then be rolled using a 2-4 ton double barrel roller.
   4. Infield Dressing: The Infield Top Dressing shall then be applied evenly covering the infield material. With a light weight screen drag the field should be dragged to final game ready conditions.
   5. Home Plate and Pitchers Circle: Install clay loam soil in the batter's box, catchers box and pitchers circle to a depth of 9" to finish grade. Clay loam soil shall be compacted to 95% maximum density ASTM-D698.

B. All finished surfaces on infield shall be to elevations shown on the drawings and smooth graded.

END OF SECTION

SECTION 133419 – METAL BUILDING SYSTEMS

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pre-engineered, shop-fabricated structural steel building frame, roof and wall panels.
B. Exterior doors, windows, skylights, overhead doors, and louvers.

1.2 REFERENCES REQUIREMENTS

A. Section 05 50 00 – Miscellaneous Metals

1.3 REFERENCE STANDARDS

A. AISC 360 – Specification for Structural Steel Buildings; American Institute of Steel Construction, Inc.; 2005.
B. ASTM A 153/A 153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardwar; 2005.
C. ASTM A 307 – Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; 2007b.
D. ASTM A 325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2009.
E. ASTM A 325M – Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2009.
F. ASTM A 500/A 500M – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2007.
G. ASTM A 501 – Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2007.
H. ASTM A 529/A 529M – Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2005.
I. ASTM A 653/A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009.
J. ASTM A 992/A 992M – Standard Specification for Structural Steel Shapes; 2006a.
K. ASTM C 1107/C 1107M – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2008.

L. AWS A2.4 – Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2007.
M. AWS D1.1/D1.1M – Structural Welding Code – Steel; American Welding Society; 2010.
N. SSPC-Paint 20 – Zinc-Rich Primers (Type I, "inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).
O. UL 580 – Standard for Tests for Uplift Resistance of Roof Assemblies; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 DESIGN REQUIREMENTS

A. Design members to withstand dead load, applicable snow load, and design loads due to pressure and suction of wind calculated in accordance with applicable code.
B. Design members to withstand UL 580 Uplift Class 60.
C. Exterior wall and roof system shall withstand imposed loads with maximum allowable deflection of (per plan) of span.
D. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.
E. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners, or other detrimental effects, when subject to temperature range of 100 degrees F°.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meeting: Convene one week before starting work of this section.

1.6 SUBMITTALS

A. See Section 01 30 00 – Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on profiles, component dimensions, fasteners.
C. Shop Drawings: Indicate assembly dimensions, locations of structural members connections; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, installation; framing anchor bolt settings, sizes, and locations from datum, foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.
D. Samples: Submit two samples of pre-coated metal panels for each color selected, 6"x6" inch in size illustrating color and texture of finish.

E. Manufacturer's Instructions: Indicate preparation requirements, anchor bolt placement.
F. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.
G. Project Record Documents: Record actual locations of concealed components and utilities.

1.7 QUALITY ASSURANCE

A. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of the work.
    1. Design Engineer Qualifications: Licensed professional engineer, register to practice in the State of Texas.
    2. Conform to applicable code for submission of design calculations as required for acquiring permits.
    3. Cooperate with regulatory agency or authority and provide data as requested.
B. Perform work in accordance with AISC 360 – Specification for Structural Steel Buildings.
    1. Maintain one copy on site.
C. Perform welding in accordance with AWS D1.1.
D. Manufacturer Qualifications: Company specializing manufacturing the Products specified in this section with minimum three years documented experience.
E. Erector Qualifications: Company specializing in performing the work of this section approved by manufacturer.

1.8 WARRANTY

A. See Section 01 78 00 – Closeout Submittals, for additional warranty requirements.
B. Correct defective Work within a five year period after Date of Substantial completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Pre-engineered buildings:
    1. Southern Steel Fabricators: www.southernsteelfabricators.com.
    2. Royal Metal Buildings & Components: www.royalmbc.com
    3. Substitutions: See Section 01 60 00 – Product Requirements.

2.2 PRE-ENGINEERED BUILDING

A. Single span rigid frame.
B. Wall System: Preformed metal panels of horizontal profile, with sub-girt framing/ anchorage assembly, and accessory components.
C. Roof System: Preformed metal panels oriented parallel to slope, with sub-girt framing/ anchorage assembly, insulation, and liner panels, and accessory components.
D. Roof Slope: Per Engineers drawings.

2.3 MATERIALS- FRAMING

A. Structural Steel Members: ASTM A 572/A 572M, Grade 50.
B. Structural Tubing: ASTM A 500, Grade B cold-formed.
C. Plate or Bar Stock: ATM A 529/A 529M, Grade 50.
D. Anchor bolts: ASTM A 307, galvanized to ASTM A 153/A 153M.
E. Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, galvanized to ASTM A 153/A 153, Class C.
F. Welding Materials: Type required for materials being welded.
G. Primer: SSPC-Paint 20, zinc rich.
H. Grout: ASTM C 1107/C 1107M, Non-shrink type, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing minimum compressive strength of 2,400 psi in two days and 7,000 psi in 28 days.

2.4 COMPONENTS

A. Doors and frames
B. Frames
C. Wall Louvers

2.5 FABRICATION- FRAMING

A. Fabricate members in accordance with AISC Specification for plate, bar, tube, or rolled structural shapes.
B. Anchor Bolts: Formed with bent shank, assembled with template for casting into concrete.

2.6 FABRICATION- GUTTERS AND DOWNSPOUTS

A. Fabricate of same material and finish as roofing metal.
B. Form gutters and downspouts of aluminum profile and size indicated to collect and remove water. Fabricate with connection pieces.

C. Form sections in maximum possible lengths. Hem exposed edges. Allow for expansion at joints.
D. Fabricate support straps of same material and finish as roofing metal, color as selected.

2.7 FINISHES

A. Framing Members: Clean, prepare, and shop prime. Do not prime surfaces to be field welded.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position.

3.2 ERECTION- FRAMING

A. Erect framing in accordance with AISC 360 – Specification for Structural Steel Buildings.
B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.
C. Set column base plates with non-shrink grout to achieve full plate bearing.
D. Do not field cut or alter structural members without approval.
E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.3 ERECTION – WALL AND ROOF PANELS

A. Install in accordance with manufacturer's instructions.
B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.
C. Fasten cladding system to structural supports, aligned level and plumb.
D. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.
E. Provide expansion joints where indicated.
F. Use concealed fasteners.
G. Install insulation and vapor retarder utilizing Purlins for attachment. Place wire mesh under vapor retarder for support between framing members.

H. Install sealant and gaskets to prevent weather penetration.

3.4 ERECTION – GUTTERS AND DOWNSPOUTS

A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.
B. Apply bituminous paint on surfaces in contact with cementitious materials.
C. Slope gutters minimum 1/8 inch/ft.
D. Install splash pans under each downspout spilling into grade.

3.5 INSTALLATION – ACCESSORIES

A. Install door frames, doors, and windows and glass in accordance with manufacturer's instructions.
B. Seal wall and roof accessories watertight and weather tight with sealant in accordance with Section 07 9005.

3.6 TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.
B. Siding and Roofing: 1/8 inch from true position.

END OF SECTION

SECTION 13 68 00 – BASEBALL FIELD CONSTRUCTION

PART 1 -GENERAL

1.1 SUMMARY

This section includes the furnishing of all equipment, materials and labor for the construction of baseball and softball fields.

1.2 RELATED WORK

1. Soccer Field Construction. Section 13780.

PART 2 - PRODUCTS

2.1 TOPSOIL

A. Topsoil shall be free of lumps, stones, trash and spongy or otherwise objectionable material and approved by the Engineer.

B. Typical High School, Youth Level, Intramural/Recreation Fields

Root zone topsoil to be an imported sandy loam that meets the following specifications:

70-80% Sand

Very Course Sand: 1-2 mm

Coarse Sand: .5-1 mm

Medium Coarse Sand: .25-.5 mm

Fine Sand: .1-.25 mm

< 10% Fine Sand

Very Fine Sand: .01-.05 mm

< 15% Silt

.003-.05 mm

< 15% Clay

< .002 mm

Soil pH- 6.5-7.5

2.2 INFIELD SKINNED AREA MATERIAL

A. Root zone topsoil to be an imported sandy loam that meets the following specifications (see approved vendor list for infield skinned area material):

60-65% Sand
15-20% Silty Loam

15-20% Clay

2.3 GRASS SEED

A. TifSport, Tif 419 or Tex Turf 10 (aka Texas Turf) hybrid bermuda grass or other approved hybrid bermuda grass appropriate for subject project. Till topsoil/compost, lightly rake to scarify, spread seed, lightly rake, roll flat, fertilize and begin watering program. Overseed rate is 6-8 pounds per thousand square feet. Apply seed at double the rate as overseeding.

2.4 NETTING

A. Baseball field netting shall be designed, provided and installed by the following company, or approved equal (Engineer shall review and approve design prior to installation):

America's Nationwide Netting, Inc., D.B.A. Nets Of Texas

P.O. Box 1776

Cypress, TX 77410

800-335-9289 (281) 374-0506

800-335-9290 Fax: 281.374.0532

www.netsoftexas.co info@netsoftexas.co

Netting:

Type:	# 36 Dupont Knotted Nylon offering substantially less wind resistance than knotless netting,
Wind Load:	Surface Area-9%
Size:	1 ¾" Square Mesh
Tensile Strength:	350 lbs. per mesh
Burst Strength:	1400 per mesh
Warranty:	1 Year Manufacturer Warranty

Perimeter Rope:

Type:	Black Nylon: preshrunk, double-treated for extra U.V. Protection
Size:	3/8 Diameter
Tensile Strength:	4000 lbs minimum

Cable:

Type:	3/8" Aircraft Cable – Used at top and bottom of poles
Tensile Strength:	15,000
Cable Clips:	Galvanized-Minimum 2 each per connection
Cable Shackles:	¼" Galvanized; attached 2' O.C. to perimeter cable and rib cable. Breaking strength 1,400 # minimum.
Cable Turn Buckles:	¾" Galvanized x 12"
Cable Eye Bolts:	¾" Galvanized x 12"

1.5 MISCELLANEOUS BASEBALL EQUIPMENT AND ACCESSORIES: Foul Poles, Bases, Plugs, Home Plate, Dugout Benches and Bleachers will be provided by Owner to be installed by Contractor.

PART 3 - EXECUTION

B. PLAYING SURFACE CONSTRUCTION

Provide numbers showing the exact type and amount of bulk materials for topsoil and infield mix (if applicable). Provide volume in yards or weight in tons that is planned for construction for the baseball fields.

Subgrade to be tilled to a sufficient depth to allow for close tolerance laser grading. Contractor shall use laser grading equipment for final surface grading. That includes automatic, hydraulically controlled laser grading system. The tolerance for laser grading the final grade shall be (+) or (-) 1/2 inch. Compact with 2 ton roller while grading.

C. TOPSOIL INSTALLATION

Root zone topsoil to be screened to remove vegetation, roots, rocks or any other debris larger than ½ inch.

Root zone soil to be installed on top of sub grade to the five inches (5") for all baseball playing fields in all areas where turf grass is to be planted.

A particular size distribution test by an independent lab must be provided to owner prior to installation.

Compact with 2 ton roller.

BASEBALL AND/OR SOFTBALL FIELD

CONSTRUCTION General Field Construction

Methods

- Detailed field layout shall be performed when grade work on the subgrade is complete. All grass/red dirt edges to be laid out and painted to allow for accurate placement of sprinkler heads.
- Irrigation system to be installed on the subgrade.
- Irrigation lateral lines should be at least 12 inches deep (on subgrade).
- All valves, swing joint and quick couplers are to be installed before infield mix and root zone topsoil are installed. Each swing joint is to be capped with PVC cap (with 1;4 inch hole drilled in cap) and marked with scrap PVC pipe at least 2 foot long.
- Valve box covers are to be installed over valves at finish grade elevation. Mark valves and quick couplers with scrap PVC pipe at least 2 foot long.

Infield Skinned Area Construction

- Layout infield grass/skinned area edges with string lines and paint.
- Install ½ inch plywood strips (as forms) on all edges (to keep skinned area material separated from root zone topsoil).
- Install skinned area material in 2-3 inch lifts and with 2 ton roller. After skinned area material / root zone topsoil are in place and compacted, plywood forms shall be removed and final grading and compacting shall be performed.

Infield Skinned Area Material Installation

- Infield mix shall be screened to remove all vegetation and debris larger than *112* inch.

Infield Conditioner

- Diamond Pro infield conditioner (vitrified clay) or approved equal.
- *Baseball Infields:* 24 tons- Install approximately 15 tons on infield (initially) with top dresser and mix into the top 2 to 3 inches of the skinned area with a tiller or an aerator. Then apply the remaining 9 tons as uniform topdressing.
- *Softball:* 10-12 tons – Install approximately 10 tons (initially) with top dresser and mix into the top 2 to 3 inches of the skinned area with

a tiller or an aerator.

- *Youth Baseball:* 3-4 tons total.

Pitchers Mound Construction

- Mounds shall be constructed with a material that is similar to the skinned area soil mix. If possible this material will have a slightly higher content of clay.
- Desired material consistency:

  50-55% Sand

  15-20% Silt

  25-30% Clay

- The material shall be installed in 3 to 4 inch lifts and compacted between each lift. If the material is dry, wet the material and allow time for the water to "soak in" before compacting. Repeat procedure until finish grade achieved.

Home Plate Circle

- The home plate circle should be constructed with the same type of material as used on the infield skinned area. The entire circle should have a slight crown or a one way slope to shed water to match field slopes.
- The batters boxes and catchers box should have a 2 inch layer of mound clay installed and compacted in these areas.

Seeding.

- Contractor is responsible for assessing and correction any soil conditions prior to seeding.
- Work with owners' representative to schedule and monitor irrigation cycles and run times for an agreed upon grown-in period of at least 4 weeks.
- Topdress seeded grass areas with clean washed sand once 8 to 10 weeks after planting if good growth has been established, unless soil conditions are such that no topdressing is required. Use approximately 30 tons of washed sand per acre and drag to smooth after topdressing.

- Topdressing must be carried out using large material handler and broadcast spreading method. Absolutely no shovels and wheelbarrows.
- Begin mowing 30 days after planting. Mow grass twice per week until end of agreed upon 60 day maintenance period.
- Grow-in package to include 2 fertilizer and selective weed control applications by a commercially licensed applicator.
- Contractor will be required to maintain grass until 60 days after the last section of grass has been planted if the installation is planted in sections or phases.

END OF SECTION

SECTION 310000 – EARTHWORK (UNDER BUILDING PAD)

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Protecting and preserving trees and vegetation to remain.
B. Clearing, stripping, and grubbing of portions of sties which are below the building pads.
C. Stock piling stripped topsoil in approved locations.
D. Excavating for and otherwise providing stable and compact subgrade below the building pads.
E. Placing and compaction of select fill under improved areas conform to elevations indicated on the drawings.
F. Filling and finish grading of area around buildings and other improvements using previously stripped topsoil and additional topsoil that must be purchased and delivered to the site.
G. Coordinating work of other sections affecting or affected by work of this section.

1.2 RELATED WORK

A. Section – Geotechnical Report.
B. Division 2 – Site Work: Related earthwork, civil, paving, and landscaping sections of work.

1.3 INSPECTION OF SITE

A. By making a proposal on the project, the Contractor acknowledges:
   1. That the Owner and Engineer do not guarantee the accuracy, completeness, or suitability of the contents of the Geotechnical Report or Topographic Survey.
   2. That he/she has visited the site to investigate the conditions affecting the work and has satisfied himself/herself of the character, quality and quantity of surface and subsurface materials or obstacles to be encountered.
B. The Contractor will be required to establish, maintain and be responsible for all reference points, hubs, grades, elevations, lines, and surface measurements. If any discrepancies in the documents are found, the Contractor shall promptly notify the Engineer and await instruction before proceeding.

1.4 QUALITY ASSURANCE

A. Inspection and Testing Laboratory Services: Test results shall meet or exceed the standards referenced.
B. Refer to Geotechnical Report, Topographic Survey, and Civil Drawings.

1.5 REFERENCES

A. ASTM International (ASTM)
   1. D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft^3 (600 kN-m/m^3) – Test for Moisture Unit Weight Relations of Soils and Soil Aggregate.
   2. D2922, Tests for Density of Soil and Soil Aggregate in place by Nuclear Methods.

1.6 PRE-INSTALLATION CONFERENCE

A. Refer to Section – Notification of Architect Requirements.

PART 2 - MATERIALS

2.1 MATERIALS

A. Structural Fill: Sandy clay soils free of organic or other deleterious materials, and have a maximum clay lump size of less than three (3) inches. See Construction Documents for Liquid Limit and Plasticity Index per soils report.
B. Earth Fill: Shall be excavated material approved by Engineer prior to its use as earth fill around building and landscapes areas, but not under building.
C. Stabilization Materials: Refer to Division 2.
D. Topsoil: Shall be imported, and shall be free from clay, vegetation, debris, stumps, roots, stones larger than ¾ inch diameter, or other objectionable matter.

PART 3 - EXECUTION

3.1 GENERAL

A. Unknown Utilities and Obstacles:
   1. If any unknown or uncharted utilities or objects are encountered during excavation, promptly notify the Engineer before proceeding. Arrange with utility and telephone companies for removal and relocation of their equipment, and capping of pipes and wiring as required.

B. Protection of Vegetation:
   1. Rope or fence off areas of the site that are designated to remain with vegetation to prevent vehicular traffic and construction damage.
   2. Provide wood barricades around trees and shrubs at their drip line in traffic areas to protect them from construction operations until Substantial Completion, or until barricade removal is directed by Engineer.
   3. Replace damaged trees and vegetation designated to remain with vegetation of equal kind and size. Follow supplier's recommended procedures for planting necessary replacement vegetation.

C. Clearing, Stripping and Grubbing (General):
   1. Remove brush, vegetation, debris, and surplus materials from the jobsite. Removal of other remaining impediments as may be necessary to properly execute the scope of this contract shall be included herein. Adhere to State and local code requirements for the disposal of trees and shrubs removed from the site.
   2. Do not remove trees or shrubs without the specific approval of the Engineer. Vegetation damaged, removed, killed, or constricted from normal growth patterns shall be replaced with a comparable item, or the full replacement amount credited to the Owner.

D. Drainage, Pumping and Grading:
   1. Proper drainage of site shall be maintained during construction so that ponding of surface runoff does not occur and cause construction delays and/or inhibit access to the site.
   2. Contractor shall control the grading around building so that ground is pitched to prevent water from running into the excavated areas of building or damaging other structures.
   3. Provide pumping required keeping excavated spaces clear of water during construction.
   4. If any subgrade is damaged due to flooding, damaged area shall be removed and filled with select fill. Placement and compaction of select fill shall meet the requirements for placing and compacting select fill as specified below.
   5. If the subgrades, due to any reason or cause, lose the required stability, density, or finish before the foundation structure is placed, it shall be re-compacted and refinished at the sole expense of the Contractor.

3.2 BUILDING FOUNDATION (PAD) PREPARATION

A. Site preparation area at buildings with and without adjacent sidewalks shall extend beyond the limits of the foundation area. See Construction Documents for Site Preparation limits.
B. Existing fill material, top soil vegetation, roots, debris, organic material and other miscellaneous debris shall be removed to a depth of 6 inches and legally disposed of. Actual removal depth may vary and will be determined at time of construction.
C. Over excavate the in-situ soils as required to allow the minimum amount of select structural fill to be placed beneath the slab to achieve the desired elevation. See Construction Documents for amount of select structural fill required per soils report.
D. After stripping, and excavating to the desired grade as indicated above, the exposed soil shall be proof-rolled to locate all soft or loose areas. Soils, which are observed to rut or deflect excessively under the moving load, shall be undercut and replace with properly compacted structural fill. The proof-rolling and undercutting activities shall be witnessed by a representative of the Geotechnical Engineer and shall be performed during a period of dry weather.
E. Subsequent to proof-rolling, and just prior to placement of fill, the exposed subgrade within the construction areas shall be evaluated for moisture and density. The subgrade soils shall be at or above the optimum moisture content, and have an in-place dry density of at least 95 percent of the standard effort (ASTM D698) maximum dry density of the in-situ soils. If the moisture or density does not meet the above criteria, the subgrade shall be scarified to a minimum depth of 6 inches, and moisture adjusted to meet the requirements per the soils report as indicated on the Construction Documents.
F. If remediation is required, Contractor shall have any of the following remediation options:
    1. Disking and drying with natural means (if the construction schedule allows).
    2. Dry the surface soils by chemically treatment.
    3. Remove the unsuitably wet soils and replace the wet soil with select fill having acceptable moisture content. The option will be entirely up to the Contractor and no extra will be paid by the Owner.
G. After proof-rolling and undercutting has been completed, and the subgrade tested and adjusted as necessary, fill placement may begin. The first layer of fill shall be placed in a relatively uniform horizontal lift and be adequately keyed into the stripped subgrade soils.
H. Refer to construction drawings for information regarding lime-stabilized subgrade treatment.

3.3 FILL PLACEMENT

A. Structural fill materials shall be as specified in Paragraph 2.1, A above. Structural fill shall be placed in maximum lifts of eight (8) inches of loose material and shall have moisture content as indicated on the Construction Documents. If water must be added, it shall be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Each lift of structural fill shall be tested by a representative of the Geotechnical Engineer prior to placement of subsequent lifts.
B. Each lift of structural fill shall be compacted as required per the soils report and as indicated on the Construction Documents. Care shall be taken to apply compactive effort throughout the fill and fill scope areas. The moisture content and the degree of compaction of the structural fill soils shall be maintained until the construction of structures above them.
C. Contractor shall be responsible for damage caused to structure because of over excavation or excavations left open during inclement weather. Should the subgrade, for any reason or cause, lose the required stability, density, or finish before the foundation structure is placed, it shall be re-compacted and refinished at the sole expense of the Contractor.

3.4 GRADING

A. Rough Grading: Contractor shall control the grading around building so that ground is pitched to prevent water from running into the excavated areas or damaged other structures. Furnish pumping required to keep excavated spaces clear of water during construction. If a foundation excavation must remain empty through a shut-down period, cover with boards and building paper and clean out immediately when work resumes. If any subgrade should be damaged due to flooding, damaged area shall be removed and filled with select fill.
B. Finish Grading:
    1. After rough grading is completed, provide and place previously stripped material or imported top soil in the amounts required to bring the rough grade to within two (2) inches of finish grade. This earth fill shall be placed in lifts not to exceed 12 inches after compaction and shall be compacted to a dry density of at least 95 percent of the ASTM D698 maximum dry density.
    2. Assure bonding of layers of fill material in compliance with the specifications.
    3. Final and fine grading shall be done using a tractor pulled landscape rake and hand raking removing all debris immediately prior to landscaping. The final graded ground surface shall be

relatively smooth, free of organic material and in suitable condition to commence landscaping work.

C. Topsoil:
   1. Contractor shall furnish all topsoil that may be required to provide finish elevations. Topsoil material shall meet requirements of Paragraph 2.1 of this Section. Spread minimum two (2) inches of topsoil over graded areas after rough grading has been completed.
   2. At the completion of finish grading, ground surface shall be relatively smooth, free of organic material and in suitable condition to commence landscaping work.

3.5 INSPECTION AND TESTING LABORATORY SERVICES

A. Refer to Inspection and Testing Laboratory Services for laboratory services to determine the liquid limit, plastic limit and plasticity index for soils and in-place density tests for compacted material.
B. The Contractor shall cooperate with the inspection and testing laboratory in all matters pertaining to the work.

END OF SECTION

SECTION 311010 – SITE CLEARING, GRADING, AND FILLING

PART 1 GENERAL

RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Protecting existing trees and grass to remain.
   2. Removing existing trees, shrubs, groundcovers, plants, and grass.
   3. Clearing and grubbing.
   4. Stripping and stockpiling topsoil.
   5. Removing above- and below-grade site improvements.
   6. Disconnecting, capping or sealing, and abandoning site utilities in place.
   7. Temporary erosion and sedimentation control measures.

B. Related Sections include the following:
   1. Division 01 Section "Sustainable Design Requirements" for additional LEED requirements.
   2. Division 01 Section "Temporary Tree and Plant Protection" for protecting trees remaining on-site that are affected by site operations.
   3. Division 02 Section "Structure Demolition" for demolition of buildings, structures, and site improvements.
   4. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.
   5. Division 23 Section "Turf, Grasses and Plants" for finish grading including preparing and placing planting soil mixes and testing of topsoil material.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings, according to Division 01 Section "Project Record Documents," identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
   1. Do not proceed with work on adjoining property until directed by Engineer.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earth Moving."
   1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.
   1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control Drawings.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.
   1. Do not store construction materials, debris, or excavated material within fenced area.
   2. Do not permit vehicles, equipment, or foot traffic within fenced area.
   3. Maintain fenced area free of weeds and trash.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
   1. Cover exposed roots with burlap and water regularly.
   2. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
   3. Coat cut faces of roots more than 1-1/2 inches (38 mm) in diameter with emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
   4. Backfill with soil as soon as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Landscape Architect.
   1. Employ an arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.

3.4 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
   1. Owner will arrange to shut off indicated utilities when requested by Contractor.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.

C. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.
4. Use only hand methods for grubbing within tree protection zone.
5. Chip removed tree branches and stockpile in areas approved by Landscape Architect.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
1. Remove subsoil and non-soil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
2. Do not stockpile topsoil within tree protection zones.
3. Stockpile surplus topsoil to allow for re-spreading deeper topsoil.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
   1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
   2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.8 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
   1. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION

SECTION 311100 – SITE CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Cleaning of site, consisting of removal and satisfactory disposal of trees, stumps, brush, roots, logs, vegetation, debris, rubbish and other objectionable weather from the entire project area.

B. Grubbing of site, consisting of complete uprooting, removal and satisfactory disposal of all stumps, brush, roots, logs, etc., to full depth, from the project areas. All roots, branches, etc., greater than or equal to 1-1/2" in diameter shall be removed from the site. Stump hole pits shall be cleared of refuse and loose earth.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 CONDITIONS AT SITE:

A. Execute all work in an orderly and careful manner with due consideration for any and all surrounding areas, planting or structures which are to remain. Periodically, water as required to allay dust and dirt. Protect any adjacent property and improvements from damage and replace any portions damaged through this operation.

B. Coordinate and comply with the following:
   1. [Geotechnical Report.]
   2. Local ordinances and requirements of authorities having jurisdiction.

C. The Contractor shall take proper precautions to protect adjacent or adjoining property from damage caused by clearing and grubbing activities. All damage shall be repaired or replaced at Contractor's expense.

3.02 DISPOSAL OF MATERIAL:

A. Unless otherwise specified, cleared and grubbed material becomes the

property of the Contractor to be removed off-site. On site burning of combustible is not acceptable unless permission from Owner, City, and County is granted. The Contractor shall be responsible for obtaining all permits required by State and local governing agencies. The Contractor shall provide adequate fire protection to adjacent property. The Contractor will be held responsible for fire damage to adjacent trees and property. Upon completion of the burning process, the ashes are to be removed and disposed of off-site. The burn pit or pits shall be cleared of all debris and backfilled. The laboratory shall verify the removal of debris, preparation of the pit for backfill and backfill operation. The laboratory shall provide the Engineer with a report verifying the preparation and backfill of the pit. The Contractor shall furnish to the Engineer a location survey of the burn put or pits. This location survey shall be performed and certified by a Registered Professional Land Surveyor.

3.03 FINAL SITE PREPARATION

A. Remove from the site all rubbish, debris, etc., resulting from Work of this Section, except as otherwise specified above.

B. After clearing, grubbing and disking the project site, rake and pick the entire site to remove all material as outlined in Section 1.1, B above.

END OF SECTION

SECTION 312216 – FINE GRADING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Excavate to line, grade and configuration as shown in the plans and specifications for proposed and future pavement areas.

B. Fill to line, grade and configuration as shown in the plans and specifications for proposed and future pavement areas.

C. Compacting fill materials in an acceptable manner as stated herein.

1.2 RELATED SECTIONS

A. Section 31 23 00 – Earthwork

B. Section 32 16 00 – Curbs and Gutters

C. Geotechnical Report (if available) for Boring Locations and Findings of Subsurface Materials and Conditions.

D. Construction Drawings

1.3 REFERENCE STANDARDS

A. AMERICAN Society for Testing and Materials (ASTM) latest edition.
- D 422 Method for Particle Size Analysis of Soils
- D 698 Test for Moisture-Density Relations of Soils Using 5.5 lb (2.5 kg) Rammer and 12-inch (304.8 mm) Drop (Standard Proctor)
- D 1556 Test for Density of soil in place by the Sand Cone Method.
- D 1557 Test for Moisture-Density Relations of Soils using 10-lb (4.5 kg) Rammer and 18-inch (457 mm) Drop (Modified Proctor).
- D 1559 Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.
- D 2167 Test for Density of Soil in place by the Rubber Balloon Method.
- D 2216 Laboratory Determination of Moisture content of Soil.
- D 2487 Classification of Soils for Engineering Purposes.
- D 2922 Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- D 3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

D 4318 Test for Plastic Limit, Liquid, Limit, and Plasticity Index of Soils.
C 25 Chemical Analysis of Limestone, Quicklime and Hydrated Lime.
C 110 Physical Testing for Quicklime and Hydrated Lime, Wet Sieve Method.
C 618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.
C 997 Quicklime and Hydrated Lime for Soil Stabilization

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition T 88 Mechanical Analysis of Soils.

1.4 QUALITY ASSURANCE

A. Independent Testing Laboratory paid by Contractor, shall be retained to perform construction on filling operation and subgrade analysis as specified in Section 31 23 00 and as stated herein.

1.5 SUBMITTALS

A. Shop Drawings or details pertaining to excavating and filling for Pavement are not required unless otherwise shown on the drawing or Specifications or if contrary procedures to the project document are proposed.

B. Submit a sample of each type of off-site fill materials that is to be used in backfilling in tan air-tight, 10 lb container for testing laboratory or submit a gradation and certification of the aggregate material that is to be used to the testing laboratory for review.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Fill material from on-site as specified in Section 31 23 00 and approved by the Owner or Owner's Representative.
B. Acceptable stabilization fabrics and geogrids:
   1. Mirafi 500X or 600X
   2. Phillips 66 Supac 6WS
   3. Dupont Typar 3401 and 3601
   4. Trevira S1114 and S1120
   5. Tensar SS-1 and SS-2
   6. Exxon GTF-200 or 350

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify all lines, elevations and grades necessary to construct pavements, curb and gutter, bases, walkways and roadways as shown in the plans and specifications.

B. Carefully protect benchmarks, property corners, monuments or other reference points.

C. Locate and identify all site utilities that have previously been installed and may be in danger of damage by grading operations.

D. Locate and identify all existing utilities that are to remain and protect them from damage.

3.2 EXCAVATION

A. Excavate roadway ad pavement areas to line and grade as shown in the plans and specifications.

B. Engage all suitable material into the project fill areas as specified in Section31 23 00.

C. Unsuitable excavated material is to be disposed of in manner and location that is acceptable to the owner and local governing agencies.

D. Perform excavation using capable, well maintained equipment and methods acceptable to the owner and the project document requirements.

3.3 FILLING AND SUBGRADE PREPARATION

A. Areas exposed by excavation or stripping and on which subgrade preparations for paving are to be performed, including future pavement areas, shall be scarified to minimum depth of 8” and compacted to minimum of 95% of optimum density, in accordance with ASTM D698 (or 92% of optimum density, in accordance with ASTM D1557), at a moisture content of not less than 1% below and not more than 3% above the optimum moisture content. These areas shall then be proof rolled to detect any areas of insufficient compaction. Proof rolling shall be accomplished by making a minimum of two (2)

complete passes with a fully-loaded tandem-axle dump truck, or approved equivalent, in each of the two perpendicular directions under the supervision and direction of a field Geotechnical Engineer. Areas of failure shall be excavated and re-compacted as stated above.

B. Fill materials used in preparation of subgrade shall be placed in lifts or layers not to exceed 8" loose measure and compacted to a minimum density of 95% of optimum density, in accordance with ASTM D698, (or 92% of the optimum density, in accordance with ASTM D1557) at a moisture content of not less than 1% below and not more than 3% above the optimum moisture content.

C. The following table stipulates maximum allowable values for plasticity index (PI) and liquid limit (LL) of suitable fill materials to be used in the specified areas, unless specifically stated otherwise on the drawings.

	PI	LL
*Paving Area, below upper two feet	20	50
*Paving Area, upper two feet	15	40

(*References to depth are to proposed subgrde elevations.)

D. Material imported from off-site shall have a CBR (California Bearing Ratio) or LBR (Limerock Bearing Ratio) value equal to or above the pavement design subgrade CBR or LBR value indicated on the drawings.

3.4 COMPACTION

A. Maintain optimum moisture content of fill materials to attain required compaction density.

B. All materials shall be tested in accordance with Section 3 23 00.

C. An independent testing laboratory selected and paid by the Owner, shall be retained to perform testing on-site.

D. Compaction test will be as specified in Section 3 23 00 together with the following for paving areas:
   1. In cut areas not less than one compaction tests for every 10,000 square feet.
   2. In fill areas, same rate of testing for each 8" lift (measured loose).

E. If compaction requirements are not complied with at any time during construction process, remove and re-compact deficient areas until proper compaction is obtained at no additional expense to Owner.

3.5 MAINTENANCE OF SUBGRADE

A. Finished subgrades shall be verified to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction including concrete trucks and dump trucks.

C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in a manner that will comply with compaction requirements by use of material equal to or better than best subgrade material on-site. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

3.6 FINISH GRADING

A. Finish grading shall be in accordance with Section 3 23 00 and as more specifically stated herein.

B. Grading of paving areas shall be checked by string line from grade stakes (blue tops) set at not more than 50' centers. Tolerances of 0.10 feet, more or less, will be permitted. Contractor to provide engineering and field staking necessary for verification of lines, grades, and elevations. Contractor to acquire, and not cost to the Owner, the services of a Professional Engineer or Registered Land Surveyor to provide field staking and verify finished grade elevations.

END OF SECTION

SECTION 312300 – EXCAVATION AND FILL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Protection, modification and/or installation of utilities as site work progresses, paying particular attention to grade changes and any necessary staging of work.

B. Cutting, filling and grading to required lines, dimensions, contours and proposed elevations for proposed improvements.

C. Scarifying, compaction, drying and removal of unsuitable material to ensure proper preparation of areas for fills or proposed improvements.

1.2 RELATED SECTIONS

A. Section 02 41 00 – Demolition

B. Section 31 10 00 – Site Clearing

C. Section 31 22 00 – Grading

D. Geotechnical Report (if applicable) for boring locations and finding of surface materials and conditions.

E. Construction Drawings

F. Architectural Plans and Specifications as they relate specifically to the earthwork beneath the buildings, where the architectural requirements are more stringent than the civil requirements.

1.3 REFERENCE STANDARDS

A. AMERICAN Society for Testing and Materials (ASTM) latest edition.
   D 422 Method for Particle Size Analysis of Soils
   D 698 Test for Moisture-Density Relations of Soils Using 5.5 lb (2.5 kg) Rammer and 12-inch (304.8 mm) Drop (Standard Proctor)
   D 1556 Test for Density of soil in place by the Sand Cone Method.
   D 1557 Test for Moisture-Density Relations of Soils using 10-lb (4.5 kg) Rammer and 18-inch (457 mm) Drop (Modified Proctor).
   D 1559 Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.

D 2167 Test for Density of Soil in place by the Rubber Balloon Method.
D 2216 Laboratory Determination of Moisture content of Soil.
D 2487 Classification of Soils for Engineering Purposes.
D 2922 Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
D 3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
D 4318 Test for Plastic Limit, Liquid, Limit, and Plasticity Index of Soils.
C 25 Chemical Analysis of Limestone, Quicklime and Hydrated Lime.
C 110 Physical Testing for Quicklime and Hydrated Lime, Wet Sieve Method.
C 618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.
C 997 Quicklime and Hydrated Lime for Soil Stabilization

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition T 88 Mechanical Analysis of Soils.

1.4 QUALITY ASSURANCE

A. Independent Testing Laboratory paid by Contractor, shall be retained to perform construction testing on site based on the following:
   1. Building Subgrade Areas, <u>including</u> 10'-0" Outside Exterior Building Lines: In cut areas, not less than one compaction test for every 2,500 square feet. Infill areas, same rate of testing for each 8" lift (measured loose).
   2. Areas of Construction <u>exclusive</u> of building subgrade: In cut areas, not less than one compaction test for every 10,000 square feet. If fill areas, same rate of testing for each 8" lift (measured loosed).

B. If Compaction requirements are not complied with at any time during the construction process, remove and re-compact any deficient areas until proper compaction is obtained at <u>no</u> additional expense to Owner.

C. In all areas to receive pavement, a CBR (or LBR) test shall be performed for each type of material imported from off-site.

D. The following tests shall be performed on each type of on-site or imported soil material used as compacted fill as part of construction testing requirements.

1. Moisture and Density Relationship: ASTM D 698 or ASTM D1557
2. Mechanical Analysis: AASHTO T-88
3. Plasticity Index: ASTM D 4318

E. Field density tests for in-place materials shall be performed according to one of the following standards as part of construction testing requirements.
1. Sand-Cone Method: ASTM D 1556
2. Balloon Method: ASTM D 2167
3. Nuclear Method: ASTM D 2922(Method B-Direct Transmission)

F. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results. Owner, Engineer, and Contractor shall be provided with copies of reports within 96 hours of time test was performed. In event that any test performed fails to meet these specifications, Owner and Contractor shall be notified immediately by Independent Testing Laboratory.

G. All costs related to retesting due to failures shall be paid for by the Contractor at no additional expense to Owner. Owner reserves the right to employ an independent Testing Laboratory and to direct any retesting that is deemed necessary. Contractor shall provide free access to site for testing activities.

1.5 SUBMITTALS

A. Submit a sample of each type of off-site fill materials that is to be used at the site in an air tight, 10 lb container for the testing laboratory.

B. Submit the name of each material supplier and specific type and source of each material. Any change in source throughout the job requires approval of the owner or Engineer.

C. For use of fabrics or geogrids, a design shall be submitted for approval by the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Excavated and re-used material for subsoil fill as specified herein.

B. Not Applicable.

C. Imported subsoil material approved by the Owner and specified herein.

D. Not Applicable.

E. Filter/Drainage Fabrics:
   1. Mirafi 140NS
   2. Phillips 66 Supac 4NP
   3. Dupont Typar 3341

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours and datum. Locate and identify existing utilities that are to remain, and protect them from damage.

B. Notify utility companies to remove and/or relocate any utilities that are in conflict with the proposed improvements.

C. Protect plant life, lawns, fences, existing structures, sidewalks, paving and curbs from excavating equipment and vehicular traffic.

D. Protect benchmarks, property corners and all other survey monuments from damage or displacement. If a marker needs to be removed it shall be referenced by a licensed land surveyor and replace, as necessary, by the same.

E. Remove from site material encountered in grading operations that, in opinion of Owner or Owners Representative, is unsuitable of undesirable for backfilling, subgrade or foundation purposes. Dispose of in a manner satisfactory to Owner. Backfill areas with layers of suitable material and compact as specified.

F. Prior to placing fill in low areas, such as previously existing creeks, ponds, or lakes, perform following procedures:
   1. Drain water out by gravity with ditch having flow line lower than lowest elevation in low area. If drainage cannot be performed by gravity ditch, use adequate pump to obtain same results.
   2. After drainage of low areas is complete, remove mulch, mud, debris, and other unsuitable material by using acceptable equipment and methods that will keep natural soils underlying low areas dry and undisturbed.

3. If proposed for fill, all muck, mud, and other materials removed from above low areas shall be dried on-site by spreading in thin layers for observation by Owner or Owners Reprehensive. Material shall be inspected and, if found to be suitable for use as fill material, shall be incorporated into lowest elevation of site filling operation, but not under the building area or within 10'-0" of perimeter of building pad or paving subgrade. If after observation by Owner or Owners Representative, material is found to be unsuitable, all unsuitable material shall be removed from site.

3.2 EXCAVATING FOR FILLING AND GRADING

A. Classification of Excavation: Contractor by submitting bid acknowledges that he/she has investigated the site to determine type, quantity, quality, and character of excavation work to be performed. Excavation shall be considered unclassified excavation, except as may be indicated by the Contract in the "Supplementary Conditions" portion of the specification.

B. Perform excavation using capable, well maintained equipment and methods acceptable to Owner and governing agencies.

C. When performing grading operations during periods of wet weather, provide adequate drainage and ground water management to control moisture of soils.

D. Shore, brace, and drain excavations as necessary to maintain the site safe, secure, and free of water at all times.

E. Excavated material containing rock or stone greater than 6" in largest dimension is unacceptable as fill to within the proposed building and paving area.

F. Rock or stone less than 6" in largest dimensions is acceptable as fill to within 24" of surface of proposed subgrade when mixed with suitable material.

G. Rock or stone less than 2" in largest dimension and mixed with suitable material is acceptable as fill within the upper 24" of proposed subgrade.

3.3 FILLING AND SUBGRADE PREPARATION

A. Fill areas to contours and elevations shown with unfrozen materials.

B. Place fill in continuous lifts specified herein.

C. Refer to Section 31 23 00 for grading requirements for pavements.

D. Areas exposed by excavation or stripping and on which subgrade preparations are to be performed shall be scarified to minimum depth of 8" and compacted to minimum of 95% of optimum density, in accordance with ASTM D698 (or 92% or optimum density, in accordance with ASTMD D1557), at a moisture content of not less than 1% below and not more than 3% above the optimum moisture content. These areas shall then be proof rolled to detect any areas of insufficient compaction. Proof rolling shall be accomplished by making a minimum of two (2) complete passes with a fully-loaded tandem-axle dump truck, or approved equivalent, in each of the two perpendicular directions under the supervision and direction of a Field Geotechnical Engineer. Aras of failure shall be excavated and re-compacted as stated above.

E. Fill materials used in preparation of subgrade shall be placed in lifts or layers not to exceed 8" loose measure and compacted to a minimum density of 95% of optimum density, in accordance with ASTM D698, (or 92% of the optimum density, in accordance with ASTM D1557) at a moisture content of not less than 1% below and not more than 3% above the optimum moisture content.

F. Material imported from off-site shall have a CBR (California Bearing Ratio) or LBR (Limerock Bearing Ratio) value equal to or above the pavement design subgrade CBR or LBR value indicated.

3.4 MAINTENANCE OF SUBGRADE

A. Finished subgrades shall be verified to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction, including concrete trucks and dump trucks.

C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in manner that will comply with compaction requirements by use of material equal to or better than best subgrade material on site. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to specified cross-section.

3.5 RIP RAP

A. Place rip-rap in all areas where indicated on the drawings. The stone for rip-rap shall consist of field stone or rough unhewn quarry stone as nearly uniform in section as is practical. The stones shall be dense, resistant to the action of air and water, and suitable in all aspects for the purpose intended. Unless otherwise specified, all stones used as rip-rap shall weigh between 50 and 150 pounds each, and at least 60 percent of the stones shall weight more than 100 pounds each.

B. Slopes and other areas to be protected shall be dressed to the line and grade shown on the plans prior to the placing of rip-rap. Contractor shall undercut the areas to receive rip-rap to an elevation equal to the final elevation less the average diameter of the stones before placing the rip-rap.

C. Filter fabric and bedding stone shall be installed prior to the placement of the stone if so indicated on the drawings. The bedding stone shall be quarried and crushed angular limestone in accordance with Section 32 11 23 and shall be 6" in depth. Filter fabric shall be as specified herein and as detailed on the plans.

D. Stones shall be placed so that the greater portion of their weight is carried by the earth and not by the adjacent stones. The stones shall be placed in a single layer with close joints. The upright areas of the stone shall make an angle of approximately 90 degree with the embankment upward, the larger stones being placed in the lower courses. Open joints shall be filled with spalls. Stones shall be embedded in the embankment as necessary to present a uniform top surface such that the variation between tops of adjacent stones shall not exceed three inches.

3.6 FINISH GRADING

A. Grade all areas where finish grade elevations or contours are indicated on drawings, other than paved areas and buildings, including excavated areas, filled and transition areas, and landscape areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. Finished subgrade surface hall not be more than 0.10 feet above or below established finished subgrade elevation, and all ground surfaces shall vary uniformly between indicated elevations. Finish ditches shall be graded to allow for proper drainage without ponding and in a manner that will minimize erosion potential. For topsoil application, refer to Landscaping Specifications.

B. Correct all settlement and eroded areas within one (1) year after date of completion at no additional expense to Owner. Bring grades to proper elevation. Replant or replace any grass, shrubs, bushes, or other vegetation that appears dead, dying or disturbed by construction activities. Refer to Section 02270 for slope protection and erosion control.

C. Refer to Section 31 32 00 for soil stabilization using lime, cement, fly ash and geotextile fabric methods for sub-base materials.

END OF SECTION

SECTION 312316 – EXCAVATION

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable apply to this Section

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Excavation for footings, slabs-on-grade, and utilities within the building.

1.02 RELATED REQUIREMENTS

A. Section 31 00 00 – Earthwork: Fill materials, filling, and compacting.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage.

3.02 EXCAVATING

A. Remove and discard existing top soil, subgrade, paving, and etc. to a depth indicated in the contract documents to a distance of 5 feet outside the building line.

B. Excavate to accommodate new structures and construction operations.

C. Notify the Engineer of unexpected subsurface conditions and discontinue affected Work in are until notified to resume work.

D. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

E. Do not interfere with 45 degree bearing splay of foundations.

F. Correct areas that are over-excavated and load-bearing surfaces that are disturbed.

G. Grade top perimeter of excavation to prevent surface water from draining into excavation.

H. Remove excavated material that is unsuitable for re-use from site.

I. Remove excess excavated material from site.

3.03 EXCAVATION FOR FOUNDATION AFTER FILL AND BACKFILL

A. Excavate foundation beam trenches and widened beam footings to indicated elevations and dimensions.
   1. Trim bottoms to required lines and grades to leave solid base to receive other work.
   2. Remove loose material from excavations and from within the foundation lines.

B. Remove excavated materials from within the foundation lines.

C. Cut utility trenches wide enough to allow inspection of installed utilities.
   1. Hand trim excavations. Remove loose matter.

3.04 EXCAVATION SLOPING AND BENCHING

A. If excavation extends to or below a depth of 5 feet below construction grade, the General Contractor shall be required to develop a trench safety plan to protect personnel entering the excavation vicinity.

3.05 FIELD QUALITY CONTROL

A. Quality Requirements, for general requirements for field inspection and testing.
B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

END OF SECTION

SECTION 312333 - TRENCH EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. Excavation, shoring, dewatering, pipe bleeding, trench backfill, compaction, grading and cleanup of all pipeline trenching for the project.

B. All work must be done in accordance with these specifications and the safety requirements of the State and OSHA Standards.

1.02 JOB CONDITIONS

A. Site Acceptance
   1. Accept site in condition existing during Contract time frame.
   2. Ground water/surface water found during construction is conditions of the contract and responsibility of Contractor.

B. Adverse Weather
   1. Place no backfill that is excessively wet or frozen.
   2. Place no backfill in excessively wet or frozen trenches.

PART 2 - PRODUCT

2.01 MATERIAL CLASSIFICATIONS

A. Materials for backfill shall be classified for the purpose of quality control in accordance with the Unified Soil Classification Symbols as defined in ASTM D2487. Material use and application is defined in utility installation specifications and Drawings either by class, as described in Paragraph 2.10B, or by product descriptions, as given in Paragraph 2.02.

B. Class Designations Based on Laboratory Testing:
   1. Class I: Well-graded sands and gravels, gravel-sand mixtures, crushed well- graded rock, little or no fines (GW,SW)
      a. Plasticity Index: Non-plastic
      b. Gradation: D60/D10 – greater than 4 percent. Amount passing No. 200 ≤5%.

C. Class II: Poorly-graded gravels and sands, silty sands and gravels, little to moderate fines (GM, GP, SP, and SM)
      a. Plasticity Index: Non-plastic to 4
      b. Gradation (GP, SP): Amount passing No. 200 Sieve – less than

5%.

c. Gradation (GM, SM): Amount passing No. 200 Sieve – 12% to 50%

D. Class III: Clayey gravels and sands, poorly graded mixtures of sand, gravel, and clay (GC, SC)

a. Plasticity Index

PIPE BEDDING AND BACKFILL

A. The type of bedding shall be stated on the Plans or in the Specification. Determination of source of materials for bedding and backfill to meet the stated conditions shall be responsibility of Contractor, but use of such materials shall be subject to approval of Engineer.

B. Excavated Material Backfill

1. Excavated material may be used in the trench backfill, provided that all hard rock and stones having any dimensions greater than 6" and frozen earth debris and roots larger than 2" are removed for the initial backfill. Plasticity Index shall be less than 30. Excavated backfill material must be approved by Engineer for bedding material.

C. Select Backfill

1. Select Backfill shall be gravel, fine rock cuttings, sand, sandy loam or loam free from excessive clay. Rock cuttings shall have no dimensions greater than 2 inches. Plasticity Index shall be between 7 and 22. Select backfill must be approved by Engineer.

D. Sand Backfill

1. Sand backfill shall be clean, hard, durable, uncoated grains, free from lumps and organic material. All materials must pass a No. 8 Sieve.

E. Granular Backfill

1. Granular backfill shall be free flowing, such as sand or hydraulically grade stone fines, or mixed sand and gravel, or sandy loam. The material shall be free from lumps, stones over 2 inches in diameter, clay and organic matter.

F. Controlled Density Fill

1. Use high slump mixture of Portland cement, fly ash and fine aggregate formulated, licensed and marketed as K-Krete or equal. Provide mixture with minimum 28-day compressive strength of 70 psi with no measurable shrinkage or surface settlement.

2.02 CRADLING ROCK

A. Use crushed rock or stone with 70-100% passing 1> inch sieve and no more than 50% passing 1 inch sieve.

2.03 SHEETING, SHORING AND BRACING

A. Use sound timber or structural steel.

B. Use shapes and sizes as required.

PART 3 - EXECUTION

3.01 GENERAL

A. Dewatering
1. Execute work "dry". No pipe or conduits shall be laid or concrete poured on excessively wet soil.
2. Prevent surface water from flowing into excavation.
3. Provide equipment for handling water encountered as required. Obtain approval of proposed method of dewatering.
4. No Sanitary sewer shall be used for disposal of trench water.

B. Protection of Existing Utilities:
1. Notify all utilities of location and schedule of work.
2. Locations and elevations of utilities shown on plans are to be considered approximate only. Notify utility and Engineer of conflicts between existing and proposed facilities.
3. Repair, relay or replace existing utilities damaged, destroyed or disrupted during work. Unless specified otherwise, replacement will be at the Contractors expense.

C. Sheeting, Shoring and Bracing
1. Provide as necessary, to hold walls of excavation, prevent damage to adjacent structures, and to protect workmen and property.
2. Leave Sheeting and shoring in place where removal might cause damage to work or otherwise indicated on drawings.
3. When movable trench shield is used below spring line of pipe, it shall be lifted prior to any forward movement to avoid pipe displacement.

D. Changes in Grade
1. Grades may be adjusted 1.5 feet (plus or minus) from plan grades to suit unforeseen construction conflicts or conditions with approval of Engineer.
2. No additional compensation will be made for such changes.

3.02 EXCAVATION AND TRENCHING

A. General
   1. Method of excavation at Contractor's option.
   2. Excavate by hand under tree roots 3 inches and larger, and under and around structures and utilities.
   3. Stockpile and replace topsoil to a minimum of 4-inches for surface restoration in grassed or agricultural areas.

B. Trench Characteristics
   1. Depth
      a. As indicated for pipe installation to lines and grades required with proper allowance for thickness of pipe and type of bedding specified or indicated.
   2. Width
      a. Keep width of trench as narrow as possible and yet provide adequate room for backfilling and jointing.
      b. Maximum width as follows:

Pipe Size Inches	Maximum Trench Width
4	2-feet 0-inches
6	2-feet 0-inches
8	2-feet 4-inches
10	2-feet 4-inches
12	2-feet 6-inches
15	2-feet 9-inches
18	3-feet 0-inches
Over 18	Pipe O.D. + 12-inches

   3. Trench walls must be vertical below top of pipe and may be vertical or sloped above pipe to conform to excavating codes.
   4. Provide bell holes for each pipe joint where pipe bears on undisturbed earth.
   5. Trench bottom shall be free of large stones and other foreign material.

3.03 SOFT, SPONGY OR UNSTABLE MATERIALS

A. Stop work and notify Engineer.

B. Perform remedial work as directed.

C. If material is judged unsuitable and removal is authorized, remove and replace with trench stabilizing material as directed by Engineer.

3.04 ROCK EXCAVATION

A. Excavate any rock to maintain minimum 6-inch clearance around pipe.

B. Dispose of rock material not suitable for backfill as directed by Engineer.

C. Use of explosives not permitted without prior written authorization from owner and Engineer.

D. Provide Special Hazard Insurance covering liability for blasting operations.

3.05 BEDDING

A. Place after bottom of trench has been excavated to proper depth and grade.

B. Place, compact and shape bedding material to conform to barrel of pipe to insure continuous firm bedding for fill length of pipe.

C. Provide bedding as described in following table unless indicated otherwise on Plans or in Special Conditions.

Pipe Material	Minimum Bedding Class
1. Vitrified Clay Pipe	Class C*
2. Non-reinforced Concrete Pipe	Class C*
3. Reinforced Concrete Pipe	Class D*
4. Ductile Iron Pipe	Class D*
5. Steel Cylinder	Class C*
6. Flexible or Composite Pipe (PVC)	Class 1**

*Refers to standard detail, "Pipe Envelope Requirements"
**Refers to standard detail, "Bedding Detail"

3.06 TRENCH BACKFILL

A. Use excavated material for backfill unless otherwise specified.
B. Use Sand Backfill for all trenches within 5 feet of buildings and beneath walks, parking areas, paved streets or existing exposed utilities, unless otherwise specified in the plans.

C. Initial Backfill
   1. Place after pipe has been bedded and checked for alignment, grade and internal obstructions.
   2. Carry out in an orderly fashion after authorization to cover pipe has been given.
   3. Allow no more than 300 feet of trench to be open at one time.
   4. Do not backfill until concrete or mortar has sufficiently cured.
   5. Record location of connections and appurtenances before backfilling.

6. Place by hand and hand tamp to not less than 12-inches above top of pipe, in approximately 4-inch layers.
7. Backfill simultaneously on both sides of pipe to prevent displacement.
8. Place cushion of 4-foot backfill above pipe envelope before using heavy compacting equipment.

D. Subsequent Backfill
1. Place backfill into trench at an angle so that impact on installed pipe is minimized.
2. Compaction of all backfill material shall be performed in a manner that shall not crack, crush, and/or cause the installed pipe to be moved from the established grade and/or alignment.
3. Area under or within 5-feet of pavement; and under or within 2-feet of utilities, buildings, or walks shall be mechanically compacted to the top of the subgrade in 6- inch lifts to a minimum of 95% Standard Proctor Density.
4. Areas not subject to vehicular traffic shall be backfilled in layers not more than 12- inches in depth.
5. Compaction method is at discretion of Contractor with following exceptions:
   a. If in Owner's opinion compaction method presents potential damage to pipe, it will not be allowed.
   b. Compaction of any backfill material by flooding or jetting is not allowed.
6. Mound excavated materials no greater than 6-inches in open areas only.
7. Fill upper portion of trench with topsoil as specified hereinbefore.

E. Controlled Density Fill
1. Use where shown on plans.
2. Provide suitable forms to limit volume of control density fill material.
3. Prevent flow of material into existing drain lines.
4. Protect exposed utility lines during placement.
5. Place material in accordance with suppliers' written r recommendations unless directed otherwise by Engineer.

3.07 EXCESS MATERIAL

A. Waste of excess excavated material shall be the responsibility of the Contractor.

3.08 TESTING

A. Unless specified elsewhere, testing will be responsibility of Owner.

B. Standard Proctor Density
   1. ASTM D698.
   2. One (1) required for each type of material encountered.

C. In Place Density
   1. ASTM D1556 (Sand Cone)
   2. ASTM D2167 (Balloon)
   3. ASTM D3017 (Nuclear)

D. One (1) test per each 400 cubic yards of backfill placed or as directed by the Engineer.

PART 4 - MEASUREMENT AND PAYMENT

4.01 TRENCH EXCAVATION, BACKFILL AND COMPACTION

A. When listed as a separate contract pay item, shall be measured in accordance with "Measurement and Basis of Payment" section or as shown on the Bid Proposal Form.

B. When not listed as a separate contract pay item, shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 312500 - EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.01 WORK INCLUDED

Furnish labor, materials, equipment and incidentals necessary to provide erosion and sediment control for the duration of the construction period including furnishing, installing and maintaining erosion and sediment control structures and procedures and the proper removal when no longer required.

The intent of this specification is to provide guidelines for the Contractor to adhere to all State, Federal, and Local environmental regulations. It is also the intent to provide preventive measures to keep sediment from entering any storm water system, including open channels. It is the Contractor's responsibility to adhere to all State, Federal and Local requirements. While the Owner may require the Contractor to install erosion control devices during construction, this will in no way relieve the Contractor of his responsibility.

1.02 QUALITY ASSURANCE

A. Comply with applicable requirements of all governing authorities having jurisdiction. The Specifications and the Plans are not represented as being comprehensive, but rather to convey the intent to provide complete slope protection and erosion control for both the Owner's and adjacent property.

B. Erosion control measures shall be established at the beginning of construction and maintained during the entire length of construction. On-site areas which are subject to severe erosion and off-site areas which are especially vulnerable to damage from erosion and/or sedimentation are to be identified and receive additional erosion control measures as directed by the Owner or the Engineer.

C. All land-disturbing activities shall be planned and conducted to minimize the size of the area to be exposed at any one time and to minimize the time of exposure.

D. Surface water runoff originating upgrade of exposed area shall be controlled to reduce erosion and sediment loss during the period of exposure.

E. When the increase in the peak rates and velocity of storm water runoff resulting from a land-disturbing activity is sufficient to cause accelerated erosion of the receiving ditch or stream, the Contractor shall install measures to control both the velocity and rate of release so as to minimize accelerated erosion and increased sedimentation of the stream as directed by the Owner or the Engineer.

F. All land-disturbing activities shall be planned and conducted so as to minimize off-site sedimentation damage.

G. The Contractor shall be responsible for periodically cleaning out and disposing of all sediment once the storage capacity of the drainage feature or structure receiving the sediment is reduced by one-half. The Contractor shall also be responsible for cleaning out and disposing of all sediment at the time of completion of the Work.

1.03 SUBMITTALS

1.04 STANDARDS

1.05 DELIVERY AND STORAGE [Not Used]

1.06 JOB CONDITIONS; CODES AND ORDINANCES

Comply with the local codes and ordinances. If local codes and ordinances require more stringent or additional erosion and sediment control measures during construction, Contractor shall provide such measures.

1.07 OPTIONS

1.08 GUARANTEES

PART 2 PRODUCTS

2.01 MATERIALS

A. STRAW BALES: Straw bales shall weigh a minimum of fifty (50) pounds and shall be at least 30" in length. Bales shall be composed entirely of vegetable matter and be free of seeds. Binding shall be either wire or nylon string, jute or cotton binding is unacceptable. Bales shall be used for not more than three months before being replaced. However, if weather conditions cause biological degradation of the straw bales, they

shall be replaced sooner than the three month time period to prevent a loss of structural integrity of the dike.

B. SILT FENCE: Silt fence fabric shall be nylon reinforced polypropylene fabric which has a built-in cord running the entire length of the top edge of the fabric. The fabric must meet the following minimum criteria:

Tensile Strength, ASTM D4632	90 lbs.,
Puncture Rating, ASTM D4833	60 lbs.,
Mullen Burst Rating, ASTM D3786	200 psi,
Apparent Opening Size, U.S. Sieve No.	40

Silt fence shall be "Enviro Fence" preassembled silt fence, AMXCO Silt Stop prefabricated silt fence, AMOCO Style 2155 preassembled silt fence or approved equal.

C. SILT FENCE POSTS: A minimum 2" x 2" (nominal) x 54" pressure treated wood posts of Number 2 Grade southern yellow pine or approved equal.

D. SAND BAG: Sand bag material shall be polypropylene, polyethylene, polyamide or cotton burlap woven fabric, minimum unit weight four (4) ounces per square yard, mullen burst strength exceeding 300 psi and ultraviolet stability exceeding 70%. Length shall be 24 to 30 inches, width shall be 16 to 18 inches and thickness shall be six (6) to eight (8) inches and having an approximate weight of 40 pounds. Sand bags shall be filled with coarse grade sand, free from deleterious material. All sand shall pass through a No. 10 sieve.

E. P.V.C. PIPE: Pipe shall be SDR-35 polyvinyl chloride having a minimum nominal internal diameter of 4". Pipes shall be sized for anticipated flows.

F. SOIL RETENTION BLANKET: Soil retention blankets shall consist of a geocomposite of excelsior or fiber blanket with an extruded plastic net attached to the tope side. The plastic net shall be photodegradable and the excelsior or fiber blanket shall be made smolder resistant without the use of chemicals. Soil retention blankets shall be high velocity type to resist severe runoff. The soil retention blanket shall be one (1) of the following classes and types:

1. Class 1. "Slope Protection"
   (a) Type A. Slopes of 3:1 or flatter - Clay soils
   (b) Type B. Slopes of 3:1 or flatter - Sandy soils
   (c) Type C. Slopes steeper than 3:1 - Clay soils

(d) Type D. Slopes steeper than 3:1 - Sandy soils

2. Class 2. "Flexible Channel Liner"
   (a) Type E. Short-term duration (Up to 2 Years)
   Shear Stress (t_D)< 1.0 lb./sq. ft.
   (b) Type F. Short-term duration (Up to 2 Years)
   Shear Stress (t_d) 1.0 to 2.0 lb./sq. ft.
   (c) Type G. Long-term duration (Longer than 2 Years)
   Shear Stress (t_d) > 2.0 to < 5.0 lb./sq. ft.
   (d) Type H. Long-term duration (Longer than 2 Years)
   Shear Stress (t_d) greater than 0 Equal to 5.0 lb./sq. ft.

The Contractor has the option of selecting an approved soil retention blanket provided that selection conforms to the following list of approved soil retention blankets for slope protection applications:

CLASS I. SLOPE PROTECTION

TYPE A: Slopes of 3:1 or Flatter-Clay Soils
Airtrol® ANTI-WASH®/GEOJUTE® (Regular)
Contech Standards®
Contech Standards Plus®
Green Triangle Regular®
Green Triangle Superior®
GREENSTREAK® PEC MAT
Curlex®
North American Green® S150
North American Green® S75
North American Green® SC150
POLYJUTEÔ 407/GT
SOIL SAVER®
TerraJute®
Verdyol® ERO-MAT®
Xcel Regular®
Xcel Superior®

TYPE B: Slopes of 3:1 or Flatter-Sandy Soils
Contech Standards®
Contech Standards Plus®
GEOCOIR®/DEKOWE® 700
Green Triangle Superior®
Green Triangle Regular®
North American Green® S75

North American Green® SC150
North American Green® S150
POLYJUTEÔ 407/GT
TerraJute®
Verdyol® ERO-MAT®
Xcel Superior®
Xcel Regular®

TYPE C: Slopes Steeper than 3:1-Clay Soils
Airtrol®
ANTI-WASH®/GEOJUTE® (Regular)
Contech Standards Plus®
Curlex®
Green Triangle Superior®
GREENSTREAK® PEC-MAT
North American Green® SC150
North American Green® S150
POLYJUTEÔ 407/GT
SOIL SAVER®
TerraJute®
Xcel Superior®

TYPE D: Slopes Steeper than 3:1-Sandy Soils
Contech Standards Plus®
GEOCOIR®/DEKOWE® 700
Green Triangle Superior®
North American Green® S150
North American Green® SC150
POLYJUTEÔ 407GT
TerraJute®
Xcel Superior®

CLASS II: FLEXIBLE CHANNEL LINER PROTECTION

2.02 MIXES [Not Used]

2.03 FABRICATIONS [Not Used]

2.04 MANUFACTURED PRODUCTS [Not Used]

PART 3 EXECUTION

3.01 PREPARATION

3.02 INSTALLATION

A. TEMPORARY STRAW BALE DIKE

1. Straw bales shall be embedded a minimum of 4" and securely anchored using 2" x 2" wood stakes driven through the bales into the ground a minimum of 6". Straw bales are to be placed directly adjacent to one another leaving no gap between them.
2. Bales shall be placed in a single row, lengthwise on proposed line, with ends of adjacent bales tightly abutting one another. In swales and ditches, the barrier shall extend to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale. Additional bales shall be placed behind the first row where the bales abut each other. The additional bale is used to prevent unfiltered runoff from escaping between the bales.
3. The excavated soil shall be backfilled against the barrier. Backfill shall conform to ground level on the downhill side and shall be built up to 4" above ground level on the uphill side. Loose straw shall be scattered over the area immediately uphill from a straw barrier.

B. SILT FENCE

The purpose of a silt fence is to intercept and detain water-borne sediment from unprotected areas to a limited extent. The Contractor shall excavate a 6" by 6" trench for site fence bedding along the lower perimeters of the site where necessary to prevent sediment from entering any drainage system. The Contractor shall install the silt fence in accordance with the manufacturer's recommendations and instructions. Silt fence is used during the period of construction near the perimeter of a disturbed area to intercept sediment while allowing water to percolate through. This fence shall remain in place until the disturbed area is permanently stabilized. Silt fence should not be used where there is a concentration of water in a channel or drainage way or where soil conditions prevent a minimum toe-in depth of 6" or installation of support post to depth of 12". Fabric shall overlap at abutting ends a minimum of 3' and shall be jointed such that no leakage or bypass occurs. If concentrated flow occurs after installation, corrective action must be taken such as placing rock berm in the areas of concentrated flow.

C. SAND BAG BERM

1. The purpose of a sandbag berm is to intercept sediment-laden water from disturbed areas such as construction in steam beds, create a retention pond, detain sediment and release water in sheet flow.

2. A temporary sand bag bern shall be installed across a channel or right of way in a developing or disturbed area and should be used when the contributing drainage area is greater than 5 acres. The berm shall be a minimum height of 18", measured from the top of the existing ground at the upslope toe to the top of the berm. The berm shall be sized to have a minimum width of 48" measured at the bottom of the berm and 18" measured at the top of the berm.
3. The sand bag berm shall be inspected after each rain. The sand bags shall be reshaped or replaced as needed during inspection. Additional inspections shall be made daily by the responsible party and when the silt reaches 6", the accumulated silt shall be removed and disposed of at an approved site in a manner that will not contribute to additional siltation. The sand bag berm shall be left in place until all upstream areas are stabilized and accumulated silt removed; removal must be done by hand.

D. SOIL RETENTION BLANKETS
1. A soil retention blanket (SRB) is a geotextile or biodegradable fabric placed over disturbed areas to limit the effects of erosion due to rainfall impact and runoff across barren soil. Soil retention blankets are manufactured by a wide variety of vendors addressing a wide variety of conditions such as vegetation establishment and high velocity flow. Blankets are used in areas which are difficult to stabilize such as steep slopes, drainage swales or high pedestrian traffic areas.
2. The soil retention blanket, whether installed as slope protection or as flexible channel liner, shall be placed within 24 hours after seeding or sodding operations have been completed, or as approved by the Engineer. Prior to placing the blanket, the area to be covered shall be relatively free of all rocks or clods over 1-1/2" in maximum dimension and all sticks or other foreign material which will prevent the close contact of the blanket with the soil. The area shall be smooth and free of ruts and other depressions. If as a result of rain, the prepared bed becomes crusted or eroded or if any eroded places, ruts or depressions exist for any reason, the Contractor shall be required to rework the soil until it is smooth and to reseed or resod the area at the Contractor's expense. Installation and anchorage of the soil retention blanket shall be in accordance with the manufacturer's recommendations.

E. PROTECTION OF BARE AREAS
1. Apply seeding and soil retention blanket to bare areas including new embankment areas, fills, stripped areas, graded areas or otherwise disturbed areas, which have a grade greater than 5% or which will be exposed for more than 30 days.

2. Bare working areas on which it is not practical or desirable to install seeding and soil retention blankets, as determined by the Engineer, such as areas under proposed building slabs, shall be temporarily sloped to drain at a minimum of 0.2% and a maximum of 5% grade. These areas shall then be "trackwalked" with a crawler dozer traveling up and down the slope to form the effect of small "terraces" with the tracks of the dozer. Apply a minimum of three (3) coverages to each area with the dozer tracks.
3. Route runoff from the areas through the appropriate silt fence system.
4. Protect earth spoil areas by "trackwalking" and silt fences.

F. INTERCEPTOR SWALE

1. Interceptor swales may have a v-shape or be trapezoidal with a flat bottom and side slopes of 3:1 or flatter. These are used to shorten the length of exposed slope by intercepting runoff and can also serve as perimeter swales preventing off-site runoff from entering the disturbed area or prevent sediment-laden runoff from leaving the construction site or disturbed area. The outflow from a swale must be directed to a stabilized outlet or sediment trapping device. The swales should remain in place until the disturbed area is permanently stabilized.
2. Stone Stabilization shall be used when grades exceed 2% or velocities exceed 6' per second and shall consist of a layer of crushed stone 3" thick, or flexible channel liner soil retention blankets. Stabilization shall extend across the bottom of the swale and up both sides of the channel to minimum height of 3" above the design water surface elevation based on a two year storm.
3. Interceptor swale shall be installed across exposed slopes during construction and should intercept no more than five (5) acres of runoff. Swales shall have a minimum bottom width of 2'-0" and a maximum depth of 1'-6" with side slopes of 3:1 or flatter. Swale must have positive drainage for its entire length to an outlet. When the slope exceeds 3%, or velocities exceed 4' per second (regardless of slope), stone stabilization is required. Check dams are also recommended to reduce velocities in the swales possibly reducing the amount of stabilization necessary. Swales should be inspected on a weekly basis during wet weather and repairs should be made promptly to maintain a consistent cross section.
4. All trees, brush, stumps, obstructions and other material shall be removed and disposed of so as not to interfere with the proper functioning of the swale.
5. The swale shall be excavated or shaped to line, grade, and cross-section as required to meet criteria specified herein and be free of bank projections or other irregularities which will impede normal flow.

6. All earth removed and not needed in construction shall be disposed of in an approved spoils site so that it will be conveyed to a sediment trapping device.
7. Diverted runoff from a disturbed or exposed upland area shall be conveyed to a sediment trapping device.
8. The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet.
9. Minimum compaction for the swale shall be 90% standard proctor.

G. LOCATION OF EROSION AND SEDIMENT CONTROL STRUCTURES

1. Locate erosion and sediment control structures as required to prevent erosion and removal of sediment from the project site. Silt fences shall be required for disturbed areas and soil stockpiles/spoil areas. Each silt fence installation shall have a minimum net length (exclusive of embedments into diversion dikes or other ineffective areas) of 25'. The runoff from a maximum of one (1) acre of disturbed area or soil stockpile/ spoil area shall be routed through any individual silt fence installation.
2. Install diversion dikes to divert runoff to the silt fence installation.
3. Install silt traps at the inlet (upstream) end of the drainage structures, including open channels, through which runoff from disturbed areas or soil stockpiles/spoil areas may drain.
4. Provide an overall erosion and sediment control system which protects disturbed areas and soil stockpiles/spoil areas. The system shall be modified by the Contractor from time to time to effectively control erosion and sediment during construction.

3.03 MAINTENANCE

A. Maintain erosion and sediment control structures and procedures in full working order at all times during construction. This shall include any necessary repair or replacement of items which have become damaged or ineffective. Remove sediment on a regular basis which accumulates in sediment control devices and place the material in approved earth spoil areas or return the material to the area from which it eroded.

B. Upon completion of construction, properly remove the temporary erosion and sediment control structures and complete the area as indicated.

C. Soil retention blankets will not require removal if installed on a finished graded area specified to receive seeding.

3.04 FIELD QUALITY CONTROL

In the event of conflict between the requirements and storm water pollution control laws, rules or regulations or other Federal, State or Local agencies, the more restrictive laws, rules or regulations shall apply.

3.05 CLEAN AND ADJUST [Not Used]

PART 4 - MEASUREMENT AND PAYMENT

4.01 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

A. When listed as a separate contract pay item, shall be measured in accordance with "Measurement and Basis of Payment" section or as shown on the Bid Proposal Form.

B. When not listed as a separate contract pay item, shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 313116 - TERMITE CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Chemical soil treatment
B. Termite Shields

1.02 REFERENCE STANDARDS

A. Title 7, United States Code, 136 through 136y – Federal Insecticide, Fungicide and Rodenticide Act; United States Code; 1947 (Revised 2001).

1.03 SUBMITTALS

A. See – Administrative Requirements, for submittal procedures.
B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.
C. Test Reports: Indicate regulatory agency approval reports when required.
D. Manufacturer's Application Instructions: Indicate caution requirements.
E. Manufacturer's Certificate: Certify that toxicants meet or exceed specifies requirements.
F. Warranty: Submit warranty and ensure that forms have been completed.

1.04 QUALITY ASSURANCE

Not used

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for requirements for application, and comply with EPA regulations.
B. Provide certificate of compliance form authority having jurisdiction indicating approval of toxicants.

1.06 WARRANTY

A. See – Closeout Submittals, for additional warranty requirements.

B. Provide five year installer's warranty against damage to building caused by termites.

1.07 SUMMARY

A. Provide soil treatment for termite control, as herein specified, prior to placement of vapor barrier under concrete work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manufacturers:
   1. Bayer Environmental Science Corp; Product____: www.nobugs.com.
   2. FMC Professional Solutions; Product___: www.fmcprosolutions.com
   3. Syngenta Professional Product; Product___: www.syngentaprofessionalproducts.com
   4. Substitutions: See Section 01 6000 – Product Requirements.

B. Toxicant Chemical: EPA approved; synthetically color dyed to permit visual identification of treated soil.

C. Diluent: Recommended by toxicant manufacturer.

D. Metal termite shields for structural components which come into contact with the ground below suspended concrete slabs (not applicable for slab-on-grade conditions).

PART 3 – EXECUTION

3.01 APPLICATION

A. Comply with requirements of U.S. EPA and applicable state and local codes.

B. Spray applies toxicant in accordance with manufacturer's instructions.

C. Apply toxicant at following locations:

D. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.

E. Install metal termite shields on foundation walls and footings at crawl spaces and basement areas.

F. Re-treat disturbed treated soil with same toxicant as original treatment.

G. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.02 PROTECTION

A. Do not permit soil grading over treated work.

3.03 APPROVAL

A. Completion of pesticide approval form attached hereto is required for the completion of job.

END OF SECTION

SECTION 314110 – REINFORCED CONCRETE PIPE

PART 1: GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals necessary to install and test reinforced concrete pipe and fittings for raw water lines and irrigation pipelines as shown on the Drawings and as specified herein.

B. All pipe shall be manufactured for this project and no pipe shall be furnished from stock.

1.02 RELATED WORK NOT INCLUDED

A. ASTM C 1103-89 Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.

B. ASTM 361, Reinforced Concrete Low-Head Pressure Pipe

1.03 SUBMITTALS

A. Submit to the Engineer, within thirty days of the Effective Date of the Agreement, the name of the pipe and fitting suppliers and a list of materials to be furnished.

B. Submit to the Engineer, shop drawings showing layout and details of reinforcement, joint, method of manufacture and installation of pipe, specials and fittings, and a schedule of pipe lengths (including the length of individual pipes by diameter) for the entire job.

C. Prior to each shipment of pipe, submit certified test reports that the pipe for this Contract was manufactured and tested in accordance with the ASTM and ANSI/AWWA Standards specified herein.

1.04 QUALITY ASSURANCE

A. The manufacturer shall be responsible for the performance of all acceptance tests as specified in Paragraph 5.1.2 of ASTM C76. In addition, all reinforced concrete pipe to be installed under this Contract may be inspected at the plant for compliance with these Specifications by an independent testing laboratory provided by the Owner. The Contractor shall require the manufacturer's cooperation in these inspections. The cost

of inspection of all pipe approved for this Contract, plus the cost of inspection of a reasonable amount of disapproved pipe will be borne by the Owner.

B. Prior to each shipment of units for the raw water, or irrigation, pipeline, hydrostatic pressure tests on the pipe and the pipe joint shall be conducted according to the procedures of ASTM 361, section 10.4. Tests will be conducted on each run at the manufacturer's facility. Tests will be conducted on each 100 units (or less) from a run. The pipe shall be tested to a pressure of 13 psi for 30 minutes, with no visible leaks in the pipe or joints. Each test will be witnessed by the Engineer' representative.

C. Inspection of the pipe will also be made by the Engineer or other representatives of the Owner after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall immediately be removed from the job.

PART 2: PRODUCTS

2.01 REINFORCED CONCRETE PIPE

A. Except as otherwise specified herein, pipe shall conform to ASTM Standards Specifications for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe, Designation C76, Class III, Wall C. The pipe interior shall be smooth and even, free from roughness, projections, indentations, offsets, or irregularities of any kind. The concrete mass shall be dense and uniform.

B. Non-air-entraining portland cement conforming to ASTM C150, Type II shall be used. The use of a non-bleeding, water-reducing, dispersing agent may be permitted subject to the specific approval of the Engineer. The use of any other admixture will not be permitted.

C. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM C33, except for gradation, with a maximum loss of 8 percent when subjected to 5 cycles of the soundness test using magnesium sulfate. Coarse aggregate shall consist of well-graded crushed stone conforming to the requirements of ASTM C33, except for gradation, with a maximum loss of 8 percent when subjected to 5 cycles of the soundness test using magnesium sulfate. Documentation that the aggregates to be used in the manufacture of reinforced concrete pipe meet these

requirements shall be submitted to the Engineer as stated in Paragraph 1.03.

D. The 28-day compressive strength of the concrete, as indicated by cores cut from the pipe shall be not less than 6,000 psi. The concrete mass shall be dense and uniform. The average absorption shall not exceed 5.5 percent of the dry weight and no specimen shall exceed 6.0 percent. Reinforcement shall be circular for all concrete pipe. Quadrant steel shall not be used. Reinforcement shall be installed in both the bell and the spigot. At least one circumferential reinforcement wire shall be in both the bell and spigot area, and reinforcement in the bell and spigot shall be adequate to prevent damage to concrete during shipping, handling and after installation. Cores indicating reinforcing steel having less than 85 percent bond shall be cause for rejection of the lot of pipes.

E. Pipe may be rejected for any of the following reasons:

1. Exposure of any wires, positioning spacers or chairs used to hold the reinforcement cage in position, or steel reinforcement in any surface of the pipe, except for ends of longitudinal reinforcing.

2. Transverse reinforcing steel found to be in excess of ¼ inch out of specified position after the pipe is molded.

3. Any shattering or flaking of concrete at a crack.

4. Voids, with the exception of a few minor bugholes, on the interior and exterior surfaces of the pipe exceeding 1/4 inch in depth unless properly and soundly pointed with mortar or other approved material.

5. Unauthorized application of any wash coat of cement or grout.

6. A deficiency greater than ¼ inch from the specified wall thickness of pipe 30 inches or smaller in internal diameter.

7. A deficiency greater than 6% from the specified wall thickness of pipe larger than 30 inches in internal diameter, except that the deficiency may be 8% adjacent to the longitudinal form joint, provided that the additional deficiency does not lie closer than 20% of the internal diameter of the pipe. The deficiencies in wall thickness permitted herein do not apply to gasket contact surfaces in gasket joint pipe.

8. A variation from the specified internal diameter in excess of 1%, or interior surfaces which have been reworked after placing of concrete.

The variation in internal diameter permitted herein does not apply to gasket contact surface in gasket joint pipe.

9. A hollow spot (identified by tapping the internal surface of the pipe) which is greater than 30 inches in length or wider than 3 times the specified wall thickness. Repair of such defective areas not exceeding these limitations may be made as specified in Paragraph 2.01R.

10. Defects that indicate imperfect molding of concrete, or any surface defect indicating honeycomb or open texture (rock pockets) greater in size than area equal to a square with a side dimension of 2-1/2 times the wall thickness or deeper than two times the maximum graded aggregate size, or local deficiency of cement resulting in loosely bonded concrete, the area of which exceeds in size the limits of area described in Paragraph 9 above when the defective concrete is removed. Repair of such defects not exceeding these limits may be made as specified in Paragraph 2.01R.

11. Any of the following cracks:
    a. A crack having a width of 0.005 inch to 0.01 inch throughout a continuous length of 36 inches or more.
    b. A crack having a width of 0.01 inch to 0.03 inch or more throughout a continuous length of one foot or more.
    c. Any crack greater than 0.005 inch extending through the wall of pipe and having a length in excess of the wall thickness.
    d. Any crack showing two visible lines of separation for a continuous length of two feet or more, or an interrupted length of three feet or more anywhere in evidence, both inside and outside.
    e. Cracks anywhere greater than 0.03 inch in width.

F. The pipe shall be clearly marked as required by ASTM C76 in a manner acceptable to the Engineer. The markings may be at either end of the pipe for the convenience of the manufacturer, but for any one size shall always be at the same end of each pipe length. Pipe shall not be shipped until the compressive strength of the concrete has attained 4,000 psi and not before 5 days after manufacture, and/or repair, whichever is the longer.

G. Pipe shall have a minimum laying length of approximately 8 feet, except for closure and other special pieces as approved by the Engineer. The Contractor shall have available at the site of the work sufficient pipe of various lengths to affect closure at structures that cannot be located to accommodate standard lengths. Short lengths of pipe made for closure etc. may be used in the pipeline at the end of construction if properly spaced. The length of the incoming and outgoing concrete pipe at each

structure shall not exceed 4 feet, except where the joint is cast flush with the exterior wall of the structure, where steel wall fittings are provided or where otherwise noted on the Drawings. Maximum laying length shall not exceed 16 feet, but the installation of 16 foot lengths will depend upon the ability of the Contractor to handle such lengths of pipe in sheeted trenches, comply with trench width requirements, maintain the integrity of the sheeting and avoid disturbance to adjacent ground. If, in the opinion of the Engineer, the use of 16 foot lengths is impracticable, shorter lengths shall be used.

H. After manufacture, each length of pipe shall be checked against the length noted on the shop drawings. Pipe more than 1-1/2 inch longer than that shown on the shop drawings shall not be used on this project. Variations in length of the same pipe shall not exceed ASTM C76 requirements.

I. During manufacturing, measuring devices shall be used to assure joint assembly is within the tolerance of ASTM C76 and these Specifications.

J. The Engineer shall have the right to cut cores from such pieces of the finished pipe as he desires for such inspection and tests as he may wish to apply. Holes left by the removal of cores shall be filled in an approved manner by and at the expense of the manufacturer. Core drilling shall be carried out by the pipe manufacturer at his expense.

K. The Engineer shall also have the right to take samples of the concrete after it has been mixed, or as it is being placed in the forms or molds, and to make such inspection and tests thereof as he may wish.

L. At the start of the work, a set of test cylinders shall be taken each day on which pipe is manufactured for the project or more often if required. This may ultimately be reduced to one set of three specimens for every 50 cubic yards of concrete placed, if the uniformity of results warrants, and if approved by the Engineer. At the start of the work, a relationship shall be established between ultimate strength of test cylinders stored in a standard manner as compared to cylinders steam-cured with the pipe and as compared to cores taken from the corresponding finished pipe. At least five sets of tests shall be made.

M. Test cores may be taken for every 500 linear feet of pipe manufactured, but not less than once each day on which pipe is manufactured for the project. Cores may be reduced to one set of two per week (or possibly fewer, but not less than one set for every 1,500 linear feet), if a satisfactory relationship is established between cores and cylinders made and cured in the standard manner. This relation-ship shall not vary by more than 10 percent

more or less from the average ratio. Cores may be drilled in any manner which will provide a smooth core face. All pipe cylinders and cores shall be 4 inches in diameter. Cores shall be carefully saw-trimmed and capped in a vertical position with a sulfur cap of minimum thickness, at least one day before being tested.

N. Core testing shall conform to Standard ASTM Methods.

O. At the time of inspection, the pipe will be carefully examined for compliance with the appropriate ASTM and project specifications, and shop drawings. All pipes shall be inspected for general appearance, dimension, "scratch-strength", blisters, cracks, roughness, soundness, etc. Ail pipes will be checked for soundness by being tapped and scratched over a reasonable portion of the area, at least once on every 50 square inches of pipe surface. The surface shall be dense and close-textured. Cores also shall serve as a basis for rejection of pipe, particularly if lamination or poor bond of reinforcement is apparent.

P. The manufacturer shall use measuring devices to assure joint assembly is within tolerances of ASTM C76 and these Specifications. If, during construction, the pipes cannot be satisfactorily joined, the manufacturer shall pre-join the pipe at his shop.

Q. Unsatisfactory or damaged pipe will be either permanently rejected or returned for minor repairs. Only that pipe actually conforming to the Specifications and accepted will be listed for approval, shipment and payment. Approved pipe will be so stamped or stenciled on the inside before it is shipped. All pipe which has been damaged after delivery will be rejected, and if such pipe already has been laid in the trench, it shall be acceptably repaired, if permitted, or removed and replaced, entirely at the Contractor's expense.

R. Pitts, blisters, rough spots, breakage, and other imperfections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Non-shrink cement mortar used for repairs shall have a minimum compressive strength of 6,000 psi at the end of 7 days and 7,000 psi at the end of 28 days, when tested in 3-inch cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer.

S. Steel wall fittings to be used in the walls of the cast-in-place structures shall be equal to those manufactured by Interpace Corp., and shall be

compatible with rubber and steel joints of reinforced concrete pipe and prestressed concrete cylinder pipe where applicable.

2.02 JOINTS FOR CONCRETE PIPE

2.02.a. Raw Water and Irrigation Pipelines

A rubber gasket shall be the sole element of the joint depended upon to provide water-tightness. Rubber gaskets shall be solid gaskets of circular cross section. The gasket shall be confined in an annular space formed by the bell or bell ring and a groove in the spigot end of the pipe or spigot right or by shoulders on the bell and spigot ends of the pipe in such a manner that slight movement of the pipe or hydrostatic pressure can not displace the gasket and so that when the joint is assembled, the gasket is compressed to form a watertight seal. Joints shall be designed so that the gasket will not be required to support the weight of the pipe. The joint will be a Type R-4 with a formed gasket groove in spigot end, details conforming to Figures 5 and 6 of the Bureau of Reclamation Standard Specifications for Reinforced Concrete Pressure Pipe, November 1, 1991. Leading edge of bell shall be chamfered or rounded to facilitate entrance of gasket. The minimal cross-sectional area of annular space for gasket, with joint in normal concentric closure position, shall not be less than the cross-sectional area of gasket calculated using the maximum stretched cross-sectional diameter. Minimal cross-sectional area of annular space for gasket shall be calculated for minimum bell diameter, maximum spigot diameter, minimum groove width at spigot surface, and minimum groove depth. The average stretch cross-sectional area of the gasket shall meet the requirements of the Bureau of Reclamation specifications for Concrete pipe, dated November 1, 1991 for the Type R-4 joint.

2.02.b. Other Rubber Gasket Joints (These joints are not acceptable for irrigation pipelines)

A. Joints shall be the bell and spigot type of joint with provisions for using a round rubber "O-Ring" gasket in a recess in the spigot end of the pipe. The bevel on the bell of the pipe shall be between 1-1/2 degrees and 2-1/2 degrees. The diameters of the joint surfaces which compress the gasket shall not vary from the true diameters by more than 1/16 inch.

B. The round rubber "O-Ring" gaskets shall conform to ASTM C443. Two gaskets shall be submitted to the Engineer for tests at least 30 days before joining any of the pipes. Specimens of the gaskets shall be subjected to tensile tests of approximately 100 psi before and after immersion and heating tests, and shall show an elongation of at least 25 percent. Upon

release from the tensile tests, each specimen shall return to its original length.

C. Specimens shall be heated in a dry oven to 150°F for 6-hour duration and five specimens shall be tested by immersion, one each as follows: 2-hour immersion in petroleum ether, 72-hour immersion in saturation Hydrogen Sulfide solution, 72-hour immersion in 1 percent NaOH solution, 72-hour immersion in standard soap solution (80 per-cent alcohol), and 72-hour immersion in 10 percent NaCl solution. The specimens shall show no detrimental change in color, texture, or feeling upon completion of the above tests. The manufacturer shall supply test data and affidavits showing compliance with these requirements. Tests shall have been conducted within six months of the start of manufacture of the pipe.

D. The gaskets shall be designed and manufactured so that the completed joint will withstand an internal water pressure in excess of 15 psi for a period of ten minutes without showing any leakage by the gasket or displacement of it, see ASTM C443. The pipe manufacturer shall provide facilities for testing the effectiveness of the joints against leakage and one such test may be required for each 500 feet of pipe. Such tests shall be made by an internal or external pressure against the joint of at least 15 psi for a period of ten minutes. The completed joint, when installed in place in the work, shall be capable of withstanding a ground water pressure of 15 psi without exceeding the allowable leakage specified herein.

E. The pipe manufacturer shall furnish information and supervise the installation of at least the first five joints installed by the Contractor. The ends of the pipe shall be made true to form and dimension, and the bell shall be made by casting against steel forms.

F. The manufacturer shall inspect all pipe joint surfaces for out-of-roundness and pipe ends for squareness. The manufacturer shall furnish to the Engineer a notarized affidavit stating all pipe meets the requirements of ASTM C76, these Specifications and the joint design.

PART 3: EXECUTION

3.01 LAYING CONCRETE PIPE

A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe or fittings and the joint surfaces. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective.

B. The pipe shall be laid to the grade shown on the plans. The Contractor, or the Engineer shall stake the trench line with optical equipment. As soon as the excavation is completed to the normal grade of the bottom of the trench, the Contractor shall place screened gravel in the trench, and the pipe shall be firmly bedded in this gravel to conform accurately to the lines and grades indicated on the Drawings. Screened gravel shall conform to the requirements of Section 02200. Blocking under the pipe will not be permitted.

As an alternate to the above paragraph, if approved by the Engineer, the pipe may be laid on an approved subgrade of insitu soils. The trench must be excavated to grade and the trench bottom shall be finish to smooth, firm, and uniform finish. The trench shall be over excavated at the pipe bell location, so that the pipe loading shall be full resisted on the barrel of the pipe. Unstable soil shall be removed and replaced with gravel which shall be thoroughly tamped. The Engineer will determine the depth of removal, and the replacement of unstable soil shall be included in the gravel unit price item.

C. Screened gravel shall be placed and compacted to give complete vertical and lateral support for the lower section of the pipe as indicated on the Drawings. A depression shall be left in the supporting gravel, or trench bottom, at the joint to prevent contamination of the rubber gasket immediately before being forced home. Before the pipe is lowered into the trench, the spigot and bell shall be cleaned and free from dirt. Gasket, bell, and spigot shall be lubricated by a vegetable lubricant which is not soluble in water, furnished by the pipe manufacturer, and harmless to the rubber gasket. The rubber gasket shall be equalized in the spigot groove by running a smooth, round object, inserted between gasket and spigot, around the entire circumference several times. The pipe shall be properly aligned in the trench to avoid any possibility of contact with the side of the trench and fouling the gasket. As soon as the spigot is centered in the bell of the previously laid pipe, it shall be forced home with jacks or come-alongs. After the gasket is compressed and before the pipe is brought fully home, each gasket shall be carefully checked for proper position around the full circumference of the joint. Steel inserts shall be used to prevent the pipe from going home until the feeler gage is used to check the final position of the gasket. The jacks or come-alongs shall be anchored sufficiently back along the pipeline (a minimum of 5 lengths) so that the pulling force will not dislodge the pieces of pipe already in place. Only a jack or come-along shall be employed to force the pipe home smoothly and evenly and hold the pipe while backfilling is in progress. Under no

circumstances shall crowbars be used nor shall any of the motor driven equipment be used.

D. As soon as the pipe is in place and before the come-along is released, screened gravel, or select, backfill shall be placed as indicated on the Drawings and compacted for at least one-half the length of pipe. The Contractor shall take extra care to compact backfill under the pipe haunches. Not until this backfill is placed shall the come-along be released. If any motion at joints can be detected, a greater amount of back-fill shall be placed before pressure is released. When pipe laying is not in progress, including lunchtime, the open ends of the pipe shall be closed by a watertight plug or other approved means.

E. The Contractor shall carefully regulate his equipment and construction operations such that the loading of the pipe does not exceed the loads for which the pipe is designed and manufactured. Any pipe damaged during construction operations shall promptly and satisfactorily be repaired or replaced at the Contractor's expense.

F. The interior joints of all pipes, 30 inches and larger shall be filled with non-shrinking grout after the backfilling and testing is completed. Grout shall consist of one part by volume of cement, 1-1/2 parts by volume of sand, conforming to ASTM C33 and 1/4 part by volume of EMBECO or equal. The mixture shall have a dry, crumbly consistency and shall be pounded into place and troweled to make a smooth joint.

3.02 TESTING AND CLEANING

A. Irrigation, or Raw Water, Pipeline Leak Test

The installed raw water line will be blocked and filled with water to operating pressure. All visible leaks will be repaired by the Contractor. Leak repair will be made as follows: The joint will be filled with non-shrink epoxy grout with a water activated polyurethane chemical grout pneumatically injected behind the non-shrink expoxy grout.

If leaks are excessive in the installed line, the Engineer reserves the right to require the Contractor to successfully complete joint-by-joint hydrostatic tests to 13 psi for 10 minutes on each repaired joint before final acceptance.

B. Low Pressure Air Test (These tests are not required for irrigation pipelines)

1. For making low-pressure air tests, the Contractor shall use equipment specifically designed and manufactured for the purpose of testing sewer

pipelines using low-pressure air. The equipment shall be provided with an air regulator valve or air safety valve so set that the internal air pressure in the pipeline cannot exceed 8 psig. The leakage test using low-pressure air shall be made on each manhole-to-manhole section of pipeline. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested. Pneumatic plugs shall resist internal test pressure without requiring external bracing or blocking. All air used shall pass through a single control panel.

2. Low-pressure air shall be introduced into the sealed line until the internal air pressure reaches 4 psig greater than the maximum pressure exerted by ground water that may be above the invert of the pipe at the time of the test. However, the internal air pressure in the sealed line shall not be allowed to exceed 8 psig. When the maximum pressure exerted by the ground water exceeds 4 psi, the Contractor shall only conduct a infiltration test as specified in Section 01666.

   At least two minutes shall be allowed for the air pressure to stabilize in the section under test. After the stabilization period, the low-pressure air supply hose shall be quickly disconnected from the control panel. The time required in minutes for the pressure in the section under test to decrease from 3.5 to 2.5 psig (greater than the maximum pressure exerted by ground water that may be above the invert of the pipe) shall not be less than that shown in the tables prepared by the National Clay Pipe Institute.

3. If the pipe section does not pass the air test, either sectionalize the section tested to determine the location of the leak or perform a hydrostatic leak test. Once the leak has been located, repair and retest.

END OF SECTION

TABLE 31 41 30-1
TRENCH SHORING, MINIMUM REQUIREMENTS

		Size and Spacing of Members										
Depth Of Trench Feet	Kind or Condition of Earth	Uprights		Stringers		Cross Braces		Width of Trench		Maximum Spacing		
		Minimum Dimension Inches	Maximum Spacing Feet	Minimum Dimension Inches	Maximum Spacing Feet	Up to 3 Feet Inches	3-6 Feet Inches	6-9 Feet Inches	9-12 Feet Inches	12-15 Feet Inches	Vertical Feet	Horizontal Feet
5 to 10	Hard, Compact	3 x 4 or 2 x 6	6	---	---	2 x 6	4 x 4	4 x 6	6 x 6	6 x 8	4	6
	Likely to Crack	3 x 4 or 2 x 6	3	4 x 6	4	2 x 6	4 x 4	4 x 6	6 x 6	6 x 8	4	6
	Soft, Sandy or Filled	3 x 4 or 2 x 6	Close Sheeting	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4	6
	Hydrostatic Pressure	3 x 4 or 2 x 6	Close Sheeting	6 x 8	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4	6
10-15	Hard, Compact	3 x 4 or 2 x 6	4	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4	6
	Likely to Crack	3 x 4 or 2 x 6	2	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	---	6
	Soft, Sandy or Filled	3 x 4 or 2 x 6	Close Sheeting	4 x 6	4	4 x 6	6 x 6	6 x 8	8 x 8	8 x 10	4	6
	Hydrostatic Pressure	3 x 6	Close Sheeting	8 x 10	4	4 x 6	6 x 6	6 x 8	8 x 8	8 x 10	4	6
15-20	All Kinds of Conditions	3 x 6	Close Sheeting	4 x 12	4	4 x 12	6 x 8	8 x 8	8 x 10	10 x 10	4	6
Over 20	All Kinds of Conditions	3 x 6	Close Sheeting	6 x 8	4	4 x 12	8 x 8	8 x 10	10 x 12	10 x 12	4	6

Trench jacks may be used in lieu of, or in combination with cross braces
Shoring is not required in solid rock, hard shale or hard slag.
Where desirable, steel sheet piling and bracing of equal strength may be substituted for wood.

SECTION 314133 - TRENCH PROTECTION SYSTEM

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. This work shall consist of shoring, bracing, bank stabilization, bank sloping, providing trench boxes or trench shields or other equivalent means to protect employees from the effects of moving ground or cave-ins for all trenches 5-feet or more in depth.

B. All work shall be done in conformance with OSHA Safety and Health Standards (29 CFR 1926/1010 Chapter XVII Subpart P-Excavations, Trenching and Shoring.).

C. Trench safety plan shall be submitted by a Texas Registered Professional Engineer 30 days prior to commencement of any trenching operation in accordance with the Special Provisions of the specifications.

1.02 DEFINITIONS APPLICABLE TO THIS SPECIFICATION

A. "Accepted engineering requirements (or practices)" - Those requirements or practices which are compatible with standards required a Registered Professional Engineer, or other duly licensed or recognized authority.

B. "Angle of repose" - The greatest angle above the horizontal plane at which a material will lie without sliding.

C. "Bank" - A mass of soil rising above a digging level.

D. "Belled excavation" - A part of shaft or footing excavation, usually near the bottom and bell-shaped; i.e., an enlargement of the cross section above.

E. "Braces (trench)" - The horizontal members of the shoring system whose ends bear against the uprights or stringers.

F. "Excavation" - Any manmade cavity or depression in the earth's surface, including its sides, walls, or faces, formed by earth removal and producing unsupported earth conditions by reasons of the excavation. If installed forms or similar structures reduce the depth-to-width relationship, an excavation may become a trench.

G. "Faces" - See paragraph (k) of this section.

H. "Hard compact soil" - All earth materials not classified as running or unstable.

I. "Kickouts" - Accidental release or failure of a shore or brace.

J. "Sheet pile" - A pile, or sheeting, that may form one of the continuous interlocking line, or a row of timber, concrete, or steel piles, driven in close contact to provide a tight wall to resist the lateral pressure of water, adjacent earth, or other materials.

K. "Sides", "Walls", or "Faces" - The vertical or inclined earth surfaces formed as a result of excavation work.

L. "Slope" - The angle with the horizontal at which a particular earth material will stand indefinitely without movement.

M. "Stringers" (wales) - The horizontal members of a shoring system whose sides bear against the uprights or earth.

N. "Trench" - A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 15-feet.

O. "Trench shield" - A shoring system composed of steel plates and bracing, welded or bolted together, which support the walls of a trench from the ground level to the trench bottom and which can be moved along as work progresses.

P. "Unstable soil" - Earth material, other than running, that because of its nature of the influence of related conditions cannot be depended upon to remain in place without extra support, such as would be furnished by a system of shoring.

Q. "Uprights" - the vertical members of a shoring system.

R. "Wales" - See paragraph M of this section.

S. "Walls" - See paragraph K of this section.

PART 2 - PRODUCTS

No information for this section

PART 3 - EXECUTION

3.01 GENERAL PROTECTION REQUIREMENTS

A. Walkways, runways, and sidewalks shall be kept clear of excavated material or other obstructions and no sidewalks shall be undermined unless shored to carry a minimum live load of one hundred and twenty-five (125) pounds per square foot.

B. If planks are used for raised walkways, runways, or sidewalks they shall be laid parallel to the length of the walk and fastened together against displacement.

C. Planks shall be uniform in thickness and all exposed ends shall be provided with beveled cleats to prevent tripping.

D. Raised walkways, runways, and sidewalks shall be provided with plank steps on string stringers. Ramps, used in lieu of steps, shall be provided with cleats to insure a safe walking surface.

E. All employees shall be protected with personal protective equipment for the protection of the head, eyes, respiratory organs, hands, feet and other parts of the body as set forth in OSHA Standards.

F. Employees exposed to vehicular traffic shall be provided with and shall be instructed to wear warning vests marked with or made or reflectorized with high visibility material.

G. Employees subjected to hazardous dusts, gases, fumes, mists, or atmospheres deficient in oxygen, shall be protected with approved respiratory protection as set forth in OSHA Standards.

H. No person shall be permitted under loads handled by power shovels, derricks, or hoists. To avoid any spillage, employees shall be required to stand away from any vehicle being loaded.

I. Daily inspections of excavations shall be made by a competent person. If evidence of possible cave-ins or slides is apparent, all work in the excavation shall cease until the necessary precautions have been taken to safeguard employees.

3.02 SPECIFIC EXCAVATION REQUIREMENTS

A. Prior to opening an excavation, effort shall be made to determine

whether underground installations, i.e., sewer, telephone, water, fuel, electric lines, etc., will be encountered, and if so, where such underground installations are located. When the excavation approaches the estimated location of such an installation, the exact location shall be determined and when it is uncovered, proper supports shall be provided for the existing installation. Utility companies shall be contacted and advised of proposed work prior to the start of actual excavation.

B. Trees, boulders, and other surface encumbrances, located so as to create a hazard employees involved in excavation work or in the vicinity thereof at any time during operations, shall be removed o made safe before excavating is begun.

C. The walls and faces of all excavations in which employees are exposed to danger from moving ground shall be guarded by a shoring system, sloping of the ground or some other equivalent means.

D. Excavations shall be inspected by a competent person after ever rainstorm or other hazard-increasing occurrence, and the protection against slides and cave-ins shall be increased if necessary.

E. The determination of the angle of repose and design of the supporting system shall be based on careful evaluation of pertinent factors such as: Depth of cut; possible variation in water content of the material while the excavation is open; anticipated changes in materials from exposure to air, sun, water, or freezing; loading imposed by structures, equipment, overlying materials, or stored material; and vibration from equipment, blasting, traffic, or other sources.

F. Supporting systems, i.e., piling, cribbing, shoring, etc., shall be designed by a qualified person and meet accepted engineering requirements. When tie rods are used to restrain the top of sheeting or other retaining systems, the rods shall be securely anchored well back of the angle of repose. When tight sheeting or sheet piling is used, full loading due to ground water table shall be assumed, unless prevented by weep holes or drains or other means. Additional stringers, ties, and bracing shall be provided to allow for any necessary temporary removal of individual supports.

G. All slops shall be excavated to at least the angle of repose except for areas where solid rock allows for line drilling or presplitting.

H. The angle of repose shall be flattened when an excavation has water conditions, silty materials, loose boulders, and areas were erosion deep frost action and slide planes appear.

I. Clearances:
   1. In excavations which employees may be required to enter, excavated or other material shall be effectively stored and retained at least 2-feet or more from the edge of the excavation.
   2. an alternative to the clearance prescribed in subparagraph 1, the Contractor may use effective barriers or other effective retaining devices in lieu thereof in order to prevent excavated or other materials from falling into the excavation.

J. Sides, slopes, and faces of all excavations shall meet accepted engineering requirements by scaling, benching, barricading, rock bolting, wire meshing or other equally effective means. Special attention shall be given to slopes which may be adversely affected by weather or moisture content.

K. Support systems shall be planned and designed by a qualified person when excavation is in excess of 20-feet in depth, adjacent to structures or improvements, or subject to vibration or ground water.

L. Materials used for sheeting, sheet piling, cribbing, bracing, shoring and underpinning shall be in good serviceable condition, and timbers shall be sound, free from large or loose knots, and of proper dimensions.

M. Special precautions shall be taken in sloping or shoring the sides of excavations adjacent to previously backfilled excavation for a fill, particularly when the separation is less than the depth of the excavation. Particular attention also shall be paid to joints and seams of material comprising a face and the slope of such seams and joints.

N. Except in hard rock, excavations below the level of the base of footing of any foundation or retaining wall shall not be permitted, unless the wall in underpinned and all other precautions taken to insure the stability of the adjacent walls for the protection of employees involved in excavation work or in the vicinity thereof.

O. If the stability of adjoining building or walls is endangered by excavations, shoring, bracing or underpinning shall be provided as necessary to insure their safety. Such shoring, bracing or underpinning shall be inspected daily or more often, as conditions warrant, by a competent person the protection effectively maintained.

P. Diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation. Water shall not be

allowed to accumulate in an excavation.

Q. If it is necessary to place or operate power shovels, derricks, trucks, materials, or other heavy objects on a level above and near an excavation, the side of the excavation shall be sheet-piled, shored, and braced as necessary to resist the extra pressure due to such superimposed loads.

R. Blasting and the use of explosives are not allowed unless authorized in other portions of the specifications.

S. When mobile equipment is utilized or allowed adjacent to excavations, substantial stop logs or barricades shall be installed. if possible, the grade should be away from the excavation.

T. Adequate barrier physical protection shall be provided at all remotely located excavations. All wells, pits shafts, etc., shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc. shall be backfilled.

U. If possible, dust conditions shall be kept to a minimum by the use of water, salt, calcium chloride, oil, or other means.

V. In locations where oxygen deficiency or gaseous conditions are possible, air in the excavation shall be tested. Controls, as set forth in OSHA Standards shall be established to assure acceptable atmospheric conditions. When flammable gases are present, adequate ventilation shall be provided or sources of ignition shall be eliminated. Attended emergency rescue equipment, such as breathing apparatus, a safety harness and line, basket stretcher, etc. shall be readily available where adverse atmospheric conditions may exist or develop in an excavation.

W. Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.

X. Where ramps are used for employees or equipment, they shall be designed and constructed by qualified persons in accordance with accepted engineering requirements.

Y. All ladders used on excavation operations shall be in accordance with requirements of OSHA Standards.

3.03 SPECIFIC TRENCHING REQUIREMENTS

A. Banks more than 5-feet shall be shored, laid back to a stable slope or some other equivalent means of protection shall be provided where employees may be exposed to moving ground or cave-ins. Trenches less that 5-feet in depth shall also be effectively protected when examination of the ground indicates hazardous ground movement may be expected.

B. Sides of trenches in unstable or soft material, 5-feet or more in depth, shall be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect the employees working within them.

C. Sides of trenches in hard or compact soil, including embankments, shall be shored or otherwise supported when the trench is more than 5-feet in depth and 8-feet or more in length. In lieu of shoring, the sides of the trench above the 5-foot level many be sloped to preclude collapse, but shall not be steeper than a 1-foot rise to each 1/2-foot horizontal. When the outside diameter of a pipe is greater than 6-feet, a bench of 4-foot minimum shall be provided at the toe of the sloped portion.

D. Materials used for sheeting and sheet piling, bracing, shoring, and underpinning, shall be in good serviceable condition, and timbers used shall be sound and free from large or loose knots, and shall be designed and installed so as to be effective to the bottom of the excavation.

E. Additional precautions by way of shoring and bracing shall be taken to prevent slides or cave-ins when excavations or trenches are made in locations adjacent to backfilled excavations, or where excavations are subjected to vibrations from railroad or highway traffic, the operation of machinery, or any other source.

F. Employees entering bell-bottom pier holes shall be protected by the installation of a removable-type casing of sufficient strength to resist shifting of the surrounding earth. Such temporary protection shall be provided for the full depth of that part of each pier and securely fastened to shoulder harness, shall be worn by each employee entering the shafts. This lifeline shall be individually manned and separate from any line used to remove materials excavated from the bell footing.

G. Minimum requirements for trench timbering shall be in accordance with Table 19000-1. Braces and diagonal shores in a wood shoring system shall not be subjected to compressive stresses in excess of values given by the following formula:

$$S + 1300 - \frac{20L}{D}$$

$$\text{Maximum Ratio} \quad \frac{L}{D} = 50$$

Where:
L = Length, unsupported, inches
D = Least side of the timber in inches
S = Allowable stress in pounds per square inch of cross-section.

H. When employees are required to be in trenches 4-feet deep or more, an adequate means of exit, such as a ladder or steps shall be provided and located so as to require no more than 25-feet of lateral travel.

I. Bracing or shoring of trenches shall be carried along with the excavation.

J. Cross braces or trench jacks shall be placed in true horizontal position, be spaced vertically, and be secured to prevent sliding, falling, or kickouts.

K. Portable trench boxes or sliding trench shields may be used for the protection of personnel in lieu of a shoring system or sloping. Where such trench boxes or shields are used, they shall be designed, constructed, and maintained in a manner which will provide protection equal to or greater than the sheeting or shoring required for the trench. The Contractor shall provide a statement certified by a Registered Professional Engineer of the adequacy of trench boxes or shields.

L. Backfilling and removal of trench supports shall progress together from the bottom of the trench. Jacks or braces shall be released slowly and, in unstable soil, ropes shall be used to pull out the jacks or braces from above after employees have cleared the trench.

3.05 CONSTRUCTION REQUIREMENTS

A. The Contractor unless provided for in the plans otherwise shall provide the minimum shoring shown in Table 19000-1 for the soil class noted in the plans.

B. Should the soil conditions differ from those specified or should ground water be encountered in the excavation the contractor shall notify the Engineer immediately. The Contractor shall refrain from operating in that portion of the trench where changed conditions are noted until such time as an inspection of conditions takes place and the contractor is notified of measures necessary for continued operation.

C. The Contractor shall prepare and submit a plan of operation. This plan of

operation shall identify material, equipment, methods and installation and shall be inspected by a Registered Professional Engineer. The Contractor's Engineer shall certify the adequacy of the trench protection system and its adherence of OSHA Standards.

PART 4- MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. Providing shoring in trenches or other alternate means in accordance with this specification shall be measured by the linear foot of trench of specified sizes or sizes of pipe in ranges of depth to the invert elevation of the pipe or structure. Additional depth for foundations, etc. shall be considered incidental to the price bid for the protection.

B. The Contractor shall provide shoring systems for construction of structures 5-feet or greater in depth. There will be no direct payment for these systems but it shall be considered incidental to the price bid for the structure.

4.02 PAYMENT

A. The unit price bid for trench protection shall be full compensation for providing acceptable shoring or other alternate means, installing, inspecting, certifying and maintaining the shoring and for all manipulations, labor, tools, equipment and incidentals necessary to complete the work.

B. When not listed as a separate contract pay item, trench protection system shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

END OF SECTION

SECTION 321100 – BASE COURSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Granular Base

B. Caliche Base

C. Full Depth Asphalt Base

D. Hot Mix Sand Asphalt Base

E. Soil Cement Stabilized Base

1.2 RELATED SECTIONS

A. Section 31 10 00 – Site Clearing

B. Section 31 23 00 – Excavation and Fill

C. Section 32 11 23 – Aggregate Base Courses

D. Section 31 32 13.19 – Lime Soil Stabilization

E. Section 32 12 16 – Asphalt Paving

F. Section 32 13 13 – Concrete Paving

G. Section 32 16 13 – Concrete Curbs and Gutters

H. Section 32 92 23 – Sodding

I. Construction Drawings

1.3 REFERENCES

A. ANSI/ASTM D698 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 kg) Rammer and 12 inch (304.8 mm) Drop.

B. ANSI/ASTM D1557 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10 lb (4.4 kg) Rammer and 18 inch (457 mm) Drop.

C. ASTM D2167 – Test Method for Density and Unit Weight of Soil in-place by the Rubber Balloon Method.

D. ASTM D1556 – Test Method for Density of Soil in-place by the Sand-Cone Method.

E. ASTM D2922 – Test Methods for Density of Soil and Soil-Aggregate in-place by Nuclear Methods (Shallow Depth), Method B (Direct Transmission).

F. ASTM D3017 – Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Submit materials certificate to on-site independent testing laboratory which is signed by material producer and Contractor, certifying that material comply with, or exceed, the requirements herein.

PART 3 - EXECUTION

3.1 EXAMINATION

Contractor shall verify that the subgrade has been inspected, tested and the gradients and elevations are correct, dry and properly prepared.

3.2 CONSTRUCTION

A. Perform base course construction in a manner that will drain surface properly at all times and at the same time prevent runoff from adjacent areas from draining onto base course construction.

B. Compact base material to not less than 98% of optimum density as determined by ASTM D698 or 95% of optimum density, as determined by ASTM D1557, unless otherwise indicated on the drawings.

C. Granular Base: Construct to thickness indicated on drawings. Apply in lefts or layers not exceeding 8", measured loose.

D. Caliche Base: Construct to thickness indicated on drawings. Use Type A or B, Grades 1, 2, or 3 Caliche per TXDOT Spec Item 247.

E. Asphalt Institute Type IV Mix for Full Depth Asphalt Base: Construct to thickness indicated on drawings in lifts or layers not exceeding 3", measured loose.

F. Asphalt Institute Type VI, VII, or VIII Mixes for Hot Mix Sand Asphalt Bases: Construct to thickness indicated on drawings. Apply in lifts or layers not exceeding 3", measured loose.

G. Soil Cement Stabilized Base: Construct to thickness and strength as indicated on drawings and in accordance with applicable state highway specifications. If not indicated on the drawings, the minimum compressive strength shall be 500 psi, tested at 28 days.

3.3 FIELD QUALITY CONTROL

A. An Independent Testing Laboratory, selected and paid by Owner, shall be retained to perform construction testing of in-place base courses for compliance with requirements for thickness, compaction, density and tolerance. Paving base course tolerances shall be verified (by rod and level readings on not more than fifty (50) foot centers) to be not more than 0.10 feet above design elevation which will allow for paving thicknesses as shown in the drawings. Contractor shall provide instruments and suitable benchmark.
   1. The following tests shall be performed on each type of material used as base course material:
      a. Moisture and Density Relationship: ASTM D698 or ASTM D1557
      b. Mechanical Analysis: AASHTO T-88
      c. Plasticity Index: ASTM D4318
      d. Base material thickness: Perform one test for each 20,000 square foot of in-place base material area.
      e. Base material compaction: Perform one test in each lift for each 20,000 square feet of in-place base material area.
      f. Test each course of base material for compliance with applicable state highway specifications.

B. Field density tests for in-place materials shll be performed according to one of the following standards as part of construction testing requirements:

1. San-Cone Method: ASTM D1556
2. Balloon Method: ASTM D2167
3. Nuclear Method: ASSTM D2922, Method B (Direct Transmission).

C. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results. The Owner, Engineer, and Contractor shall be provided with copies of reports within 96 hours of time test was performed. In event that any test performed fails to meet these specifications, the Owner, Engineer and Contractor shall be notified immediately by Independent Testing Laboratory. The Owner reserves right to employ Independent Testing Laboratory and to direct any testing that is deemed by them to be necessary. Contractor shall provide free access to site for testing activities.

END OF SECTION

(Referenced from 2004 TxDOT, ITEM 260 Lime Treatment (Road-Mixed) – references made to any other Sections of the 2004 TxDOT Manual shall become part of the Contract to be followed)

260. Description. Mix and compact lime, water, and subgrade or base (with or without asphaltic concrete pavement) in the roadway.

260.2. Materials. Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications. Notify the Engineer of the proposed material sources and of changes to material sources. Obtain verification from the Engineer that the specification requirements are met before using the sources. The Engineer may sample and test project materials at any time before compaction. Use Tex-100-E for material definitions.

A. Lime. Furnish lime that meets the requirements of DMS-6350 "Lime and Lime Slurry," and DMS-6330, "Lime Sources Prequalification of Hydrated Lime and Quicklime." Use hydrated lime, commercial lime slurry, or quicklime, as shown on the plans. When furnishing quicklime, provide it in bulk.

B. Flexible Base. Furnish base material that meets the requirements of Section 02601, "Flexible Base," for the type and grade shown on the plans, before the addition of lime.

C. Water. Furnish water free of industrial wastes and other objectionable material.

D. Asphalt. When asphalt or emulsion is permitted for curing purposes, furnish materials that meet the requirements of Section 02577, "Asphalts, Oils, and Emulsions," as shown on the plans or as directed.

E. Mix Design. The Engineer will determine the target lime content and optimum moisture content in accordance with Tex-121-E or prior experience with the project materials. The Contractor may propose a mix design developed in accordance with Tex-121-E. The Engineer will use Tex-121-E to verify the Contractor's proposed mix design before acceptance. Reimburse the Department for subsequent mix designs or partial designs necessitated by changes in the material or requests by the Contractor. When treating existing materials, limit the amount of asphalt concrete pavement to no more than 50% of the mix unless otherwise shown on the plans or directed.

260.3. Equipment. Provide machinery, tools, and equipment necessary for proper execution of the work. Provide rollers in accordance with Section 00210, "Rolling." Provide proof rollers in accordance with Section 00216, "Proof Rolling," when required.

A. Storage Facility. Store quicklime and dry hydrated lime in closed, weatherproof containers.

B. Slurry Equipment. Use slurry tanks equipped with agitation devices to slurry hydrated lime or quicklime on the project or other approved location. The Engineer may approve other slurrying methods.

Provide a pump for agitating the slurry when the distributor truck is not equipped with an agitator. Equip the distributor truck with a sampling device in accordance with Tex-600-J, Part I, when using commercial lime slurry.

C. Pulverization Equipment. Provide pulverization equipment that:

- cuts and pulverizes material uniformly to the proper depth with cutters that plane to a uniform surface over the entire width of the cut,
- provides a visible indication of the depth of cut at all times, and
- uniformly mixes the materials.

260.4. Construction. Construct each layer uniformly, free of loose or segregated areas, and with the required density and moisture content. Provide a smooth surface that conforms to the typical sections, lines, and grades shown on the plans or as directed.

A. Preparation of Subgrade or Existing Base for Treatment. Before treating, remove existing asphalt concrete pavement when shown on the plans or as directed. Shape existing material in accordance with applicable bid items to conform to typical sections shown on the plans and as directed.

When shown on the plans or directed, proof roll the roadbed in accordance with Section 00216, "Proof Rolling," before pulverizing or scarifying existing material. Correct soft spots as directed.

When new base material is required to be mixed with existing base, deliver, place, and spread the new material in the required amount per station. Manipulate and thoroughly mix new base with existing material to provide a uniform mixture to the specified depth before shaping.

B. Pulverization. Pulverize or scarify existing material after shaping so that 100% passes a 2-1/2-in. sieve. If the material cannot be uniformly processed to the

required depth in a single pass, excavate and windrow the material to expose a secondary grade to achieve processing to plan depth.

C. Application of Lime. Uniformly apply lime using dry or slurry placement as shown on the plans or as directed. Add lime at the percentage determined in Section 260.2.E, "Mix Design." Apply lime only on an area where mixing can be completed during the same working day.

Start lime application only when the air temperature is at least 35°F and rising or is at least 40°F. The temperature will be taken in the shade and away from artificial heat. Suspend application when the Engineer determines that weather conditions are unsuitable.

Minimize dust and scattering of lime by wind. Do not apply lime when wind conditions, in the opinion of the Engineer, cause blowing lime to become dangerous to traffic or objectionable to adjacent property owners. When pebble grade quicklime is placed dry, mix the material and lime thoroughly at the time of lime application. *Use of quicklime can be dangerous. Inform users of the recommended precautions for handling and storage.*

1. Dry Placement. Before applying lime, bring the prepared roadway to approximately optimum moisture content. When necessary, sprinkle in accordance with Section 00204, "Sprinkling." Distribute the required quantity of hydrated lime or pebble grade quicklime with approved equipment. Only hydrated lime may be distributed by bag. Do not use a motor grader to spread hydrated lime.

2. Slurry Placement. Provide slurry free of objectionable materials, at or above the approved minimum dry solids content, and with a uniform consistency that will allow ease of handling and uniform application. Deliver commercial lime slurry to the jobsite or prepare lime slurry at the jobsite or other approved location by using hydrated lime or quicklime, as specified.

   Distribute slurry uniformly by making successive passes over a measured section of roadway until the specified lime content is reached. Uniformly spread the residue from quicklime slurry over the length of the roadway being processed, unless otherwise directed.

D. Mixing. Begin mixing within 6 hours of application of lime. Hydrated lime exposed to the open air for 6 hours or more between application and mixing, or that experiences excessive loss due to washing or blowing, will not be accepted for payment.

Thoroughly mix the material and lime using approved equipment. Allow the mixture to mellow for 1 to 4 days, as directed. When pebble grade quicklime is used, allow the mixture to mellow for 2 to 4 days, as directed. Sprinkle the treated materials during the mixing and mellowing operation, as directed, to achieve adequate hydration and proper moisture content. After mellowing, resume mixing until a homogeneous, friable mixture is obtained.

After mixing, the Engineer will sample the mixture at roadway moisture and test in accordance with Tex-101-E, Part III, to determine compliance with the gradation requirements in Table 1.

Table 1 Gradation Requirements (Minimum % Passing)

Sieve Size	Base	Subgrade
1-3/4 in.	100	100
3/4 in.	85	85
No. 4	–	60

E. Compaction. Compact the mixture using density control, unless otherwise shown on the plans. Multiple lifts are permitted when shown on the plans or approved. Bring each layer to the moisture content directed. When necessary, sprinkle the treated material in accordance with Section 00204, "Sprinkling." Determine the moisture content of the mixture at the beginning and during compaction in accordance with Tex-103-E.

Begin rolling longitudinally at the sides and proceed toward the center, overlapping on successive trips by at least one-half the width of the roller unit. On super elevated curves, begin rolling at the low side and progress toward the high side. Offset alternate trips of the roller. Operate rollers at a speed between 2 and 6 MPH, as directed. Rework, re-compact, and refinish material that fails to meet or that loses required moisture, density, stability, or finish before the next course is placed or the project is accepted. Continue work until specification requirements are met. Rework in accordance with Section 260.4.F, "Reworking a Section." Perform the work at no additional expense to the Department.

1. Ordinary Compaction. Roll with approved compaction equipment, as directed. Correct irregularities, depressions, and weak spots immediately by scarifying the areas affected, adding or removing treated material as required, reshaping, and re-compacting.

2. Density Control. The Engineer will determine roadway density of

completed sections in accordance with Tex-115-E. The Engineer may accept the section if no more than 1 of the 5 most recent density tests is below the specified density and the failing test is no more than 3 pcf below the specified density.

a. Subgrade. Compact to at least 95% of the maximum density determined in accordance with Tex-121-E, unless otherwise shown on the plans.

b. Base. Compact the bottom course to at least 95% of the maximum density determined in accordance with Tex-121-E, unless otherwise shown on the plans. Compact subsequent courses treated under this Item to at least 98% of the maximum density determined in accordance with Tex-121-E, unless otherwise shown on the plans.

F. Reworking a Section. When a section is reworked within 72 hours after completion of compaction, rework the section to provide the required density. When a section is reworked more than 72 hr. after completion of compaction, add additional lime at 25% of the percentage determined in Section 260.2.E, "Mix Design." Reworking includes loosening, adding material or removing unacceptable material if necessary, mixing as directed, compacting, and finishing. When density control is specified, determine a new maximum density of the reworked material in accordance with Tex-121-E, and compact to at least 95% of this density or as shown on the plans.

G. Finishing. Immediately after completing compaction of the final course, clip, skin, or tight-blade the surface of the lime-treated material with a maintainer or subgrade trimmer to a depth of approximately 1/4 in. Remove loosened material and dispose of at an approved location. Roll the clipped surface immediately with a pneumatic tire roller until a smooth surface is attained. Add small amounts of water as needed during rolling. Shape and maintain the course and surface in conformity with the typical sections, lines, and grades shown on the plans or as directed.

Finish grade of constructed subgrade in accordance with Section 132.3.F.1, "Grade Tolerances." Finish grade of constructed base in accordance with Section 02601.4.D, "Finishing."

H. Curing. Cure for the minimum number of days shown in Table 2 by sprinkling in accordance with Section 00204, "Sprinkling," or by applying an asphalt material at a rate of 0.05 to 0.20 gal. per square yard as directed. Maintain moisture during curing. Upon completion of curing, maintain the moisture content in accordance with Article 132.3E, "Maintenance of Moisture and Reworking" for subgrade and Article 247.4E, "Curing" for bases prior to

placing subsequent courses. Do not allow equipment on the finished course during curing except as required for sprinkling, unless otherwise approved. Apply seals or additional courses within 14 calendar days of final compaction.

Table 2 Minimum Curing Requirements before Placing Subsequent Courses[1]

Untreated Material	Curing (Days)
PI ≤ 35	2
PI > 35	5

260.5 MEASUREMENT AND PAYMENT

A. When listed as a separate contract pay item, shall be measured in accordance with "Measurement and Basis of Payment" section or as shown on the Bid Proposal Form.

B. When not listed as a separate contract pay item, shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 32 11 23 – AGGREGATE BASE COURSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Aggregate Materials

1.2 RELATED SECTION

A. Section 02 41 00 – Demolition
B. Section 31 10 00 – Site Clearing
C. Section 31 23 00 – Excavation and Fill
D. Section 31 22 00 – Grading
E. Section 31 23 16 – Trenching and Backfill
F. Section 31 22 16 – Fine Grading
G. Section 31 32 13 – Soil Mixing Stabilization
H. Section 31 35 00 – Slope Protection
I. Construction Drawings

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) latest edition.

ANSI/ASTM C136 -	Method for Sieve Analysis of Fine and Course Aggregates.
ANSI/ASTM D698 -	Test Methods for Moisture-Density Relations of Soils and Soil Aggregate Mixtures using 5.5 lb (2.49 kg) Rammer and 12-inch (304.8 mm) Drop.
ANSI/ASTM D1557 -	Test Method of Moisture-Density Relations of soils and Soil Aggregate Mixxtures using 10 lb (4.54 kg) Rammer and 18-inch (457) Drop.
ASTM D2167 -	Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
ASTM D2487 -	Classification of Soils for Engineering Purposes.
ASTM D2922 -	Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
ASTM D3017 -	Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.
ASTM D4318 -	Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

B. American Association of State Highway and Transportation Officials (AASHTO) latest edition.
AASHTO T180 – Moisture-Density Relations of Soils Using a 10 lb (4.54 kg) Rammer and an 18-inch (457 mm) Drop.
ASSHTO M147 – Materials for Aggregate and Soil-Aggregate.

1.4 QUALITY ASSURANCE

Tests and analysis of aggregate material will be performed in accordance with standard ASTM and AASHTO procedures listed herein.

1.5 SUBMITTALS

A. Submit in air tight containers a 10-pound sample of each aggregate or mixture that is to be incorporated into the project to the testing laboratory designated by the owner.

B. Submit the name of each material supplies and specific type and source of each material. Any change in source throughout the job requires approval of the Owner and Engineer.

C. Submit material certificate to on-site independent testing laboratory which is singed by material producer and Contractor, certifying that materials comply with, or exceed the requirements herein.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All construction and materials shall meet or exceed the requirements of this section and any state highway department specification section referred to or noted on the drawings which pertain to paving base course design, materials, preparation, and/or execution. All materials shall be as indicated on drawings and shall comply with applicable state highway specification regarding source, quality, gradation, liquid limit, plasticity index, and mix proportioning.

PART 3 - EXECUTION

3.1 STOCKPILING

A. Stockpile on-site at locations indicated by the Owner in such a manner that there will be no standing water or mixing with other materials.

3.2 BORROW SITES

A. Upon completion of borrow operations, clean up barrow areas as indicated on the plans in a neat and reasonable manner to the satisfaction of the property owner, the Owner and the Engineer.

3.3 TRANSPORTATION

A. Off-site materials shall be transported to the project using well maintained and operating vehicles. Once on the job site, all transporting vehicles shall stay on designated haul roads and shall at no time endanger any of the improvements by rutting, overloading or pumping the haul road.

END OF SECTION

(Referenced from 2004 TxDOT, ITEM 210 Rolling – references made to any other Sections of the 2004 TxDOT Manual shall become part of the Contract to be followed)

00210.1. Description. Compact embankment, subgrade, base, surface treatments, broken concrete pavement, or asphalt pavement using rollers. Break up asphalt mats, pit run material, or base materials.

00210.2. Equipment. The Contractor may use any type of roller to meet the production rates and quality requirements of the Contract unless otherwise shown on the plans or directed. When specific types of equipment are required, use equipment that meets the requirements of this Article. The Engineer may allow the use of rollers that operate in one direction only when turning does not affect the quality of work or encroach on traffic.

Table 1
Roller Requirements[1]

Roller Type	Materials to be Compacted	Load (tons)	Contact Pressure	Roller Speed (mph)
Steel wheel	Embankment, subgrade, base, asphalt concrete	≥ 10	≥ 325 lb. per linear inch of wheel width	2–3
Tamping	Embankment, subgrade, base	–	125–550 psi per tamping foot	2–3
Heavy tamping	Embankment, subgrade, base	–	≤ 550 psi per tamping foot	2–3
Vibratory	Embankment, subgrade, base, asphalt concrete	Type A < 6 Type B > 6 Type C as shown on plans	Per equipment specification and as approved	As approved
Light pneumatic	Embankment, subgrade, base, surface treatment	4.5–9.0	≥ 45 psi	2–6
	Asphalt Concrete			4–12
Medium pneumatic	Same as light pneumatic	12–25	≥ 80 psi, as directed	Same as light pneumatic
Heavy pneumatic	Embankment, subgrade, base, previously broken concrete pavement, other pavements	≥ 25	≤ 150 psi	2–6
Grid	Embankment, base, breaking up existing asphalt mats or base	5–13	–	2–3

1. Unless otherwise specified in the Contract.

A. Static Steel Wheel Rollers. Furnish single, double, or triple steel wheel, self-propelled power rollers weighing at least 10 tons capable of operating in a forward and backward motion. Ensure all wheels are flat. When static steel wheel rollers are required, vibratory rollers in the static mode may be used.

For single steel wheel rollers, pneumatic rear wheels are allowed for embankment, subgrade, and base. For triple steel wheel rollers, provide

rear wheels with a minimum diameter of 48 in., a minimum width of 20 in., and a minimum compression of 325 lb. per inch of wheel width.

B. Tamping Rollers**.** Furnish self-propelled rollers with at least 1 self-cleaning metal tamping drum capable of operating in a forward or backward motion with a minimum effective rolling width of 5 ft. For rollers with more than 1 drum, mount drums in a frame so that each drum moves independently of the other. Operate rollers in static or vibratory mode.

1. Tamping Roller (Minimum Requirement). For all tamping rollers except for heavy tamping rollers, provide tamping feet that exert a static load of 125 to 550 psi and project at least 3 in. from the surface of the drum.

2. Heavy Tamping Roller**.** Provide tamping rollers that have:

- 2 metal tamping drums, rolls, or shells, each with a 60-in. minimum diameter and a 5-ft. minimum width, or
- 1 rear and 2 forward drums, each with a 60-in. minimum diameter. Arrange drums so that the rear drum compacts the space between the 2 forward drums and the minimum overall rolling width is 10 ft.

Equip drums with tamping feet that:

- project at least 7 in. from the drum surface,
- have an area of 7 to 21 sq. in.,
- are self-cleaning,
- exert a static load of at least 550 psi, and
- are spaced at 1 tamping foot per 0.65 to 0.70 sq. ft. of drum area.

C. Vibratory Rollers. Furnish self-propelled rollers with at least 1 drum equipped to vibrate. Select and maintain amplitude and frequency settings per manufacturer's specifications to deliver maximum compaction without material displacement or shoving, as approved. Furnish the equipment manufacturer's specifications concerning settings and controls for amplitude and frequency. Operate rollers at speeds that will produce at least 10 blows per foot unless otherwise shown on the plans or approved. Pneumatic rear wheels are allowed for embankment, subgrade, and base. Equip each vibrating drum with:

- separate frequency and amplitude controls,
- controls to manually start and stop vibration, and
- a mechanism to continuously clean the face of the drum.

For asphalt-stabilized base and asphalt concrete pavement, furnish a roller that also has the ability to:

- automatically reverse the direction of the rotating eccentric weight,
- stop vibration before the motion of the roller stops, and
- thoroughly moisten the drum with water or approved asphalt release agent.

1. **Drum (Type A).** Furnish a roller with a static weight less than 6 tons and a vibratory drum.
2. **Drum (Type B).** Furnish a roller with a minimum static weight of 6 tons and a vibratory drum.
3. **Drum (Type C).** Furnish a roller as shown on plans.

D. Pneumatic Tire Rollers. Pneumatic tire rollers consist of rubber tire wheels on axles mounted in a frame with either a loading platform or body suitable for ballast loading. Arrange the rear tires to cover the gaps between adjacent tires of the forward group. Furnish rollers capable of forward and backward motion. Compact asphalt pavements and surface treatments with a roller equipped with smooth-tread tires. Compact without damaging the surface. When necessary, moisten the wheels with water or an approved asphalt release agent.

Select and maintain the operating load and tire air pressure within the range of the manufacturer's charts or tabulations to attain maximum compaction throughout the lift, as approved. Furnish the manufacturer's chart or tabulations showing the contact areas and contact pressures for the full range of tire inflation pressures and for the full range of loadings for the particular tires furnished. Maintain individual tire inflation pressures within 5 psi of each other. Provide uniform compression under all tires.

1. Light Pneumatic Tire. Furnish a unit:
   - with at least 9 pneumatic tires,
   - with an effective rolling width of approximately 5 ft.,
   - capable of providing a total uniform load of 4.5 to 9 tons, and
   - with tires capable of maintaining a minimum ground contact pressure of 45 psi.

2. Medium Pneumatic Tire. Furnish a unit:
   - with at least 7 pneumatic tires,
   - with an effective rolling width of approximately 7 ft.,
   - capable of providing a total uniform load of 12 to 25 tons, and
   - with tires capable of maintaining a minimum ground contact pressure of 80 psi or 90 psi as directed.

3. Heavy Pneumatic Tire**.** Furnish a unit:
   - with at least 4 pneumatic-tired wheels mounted on axles carrying at most 2 wheels,
   - with wheels arranged to carry approximately equal loads on uneven surfaces,
   - with a width between 8 and 10 ft. that can turn 180° in the crown width,
   - capable of providing a total uniform load of at least 25 tons,
   - with tires capable of maintaining a maximum ground contact pressure of 150 psi, and
   - with liquid-filled tires inflated to such a level that liquid will flow from the valve stem when the stem is in the uppermost position.

E. Grid Rollers. Furnish rollers that have 2 cylindrical cages with a minimum diameter of 66 in. and a minimum width of 32 in. Mount cages in a rigid frame with weight boxes. Use a cage surface of cast or welded steel fabric grid with bars 1-1/2 in. wide, spaced on 5-in. centers in each direction, that undulate approximately 1 in. between the high and low points.
Furnish rollers capable of providing a total load of 5 to 13 tons and capable of being operated in a forward or backward motion.

F. Alternate Equipment. Instead of the specified equipment, the Contractor may, as approved, operate other compaction equipment that produces equivalent results. Discontinue the use of the alternate equipment and furnish the specified equipment if the desired results are not achieved.

00210.3. Construction. Perform this work in accordance with the applicable Items using equipment and roller speeds specified in Table 1. Use only rubber-tired equipment to push or pull compaction equipment on base courses. Use equipment that does not damage material being rolled.

00210.4. MEASUREMENT AND PAYMENT

A. When listed as a separate contract pay item, shall be measured in accordance with "Measurement and Basis of Payment" section or as shown on the Bid Proposal Form.

B. When not listed as a separate contract pay item, shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 321125 – PROOF ROLLING

(Referenced from 2004 TxDOT, ITEM 216 Proof Rolling – references made to any other Sections of the 2004 TxDOT Manual shall become part of the Contract to be followed)

00216.1. Description. Proof-roll earthwork, base, or both to locate unstable areas.

00216.2. Equipment.

A. Specified Equipment. Furnish rollers that when loaded weigh at least 25 tons. The maximum acceptable load is 50 tons. Provide rollers that meet the requirements of Section 210.2.D, "Pneumatic Tire Rollers."

B. Alternative Equipment. Instead of the specified equipment, the Contractor may, as approved, operate other compaction equipment that produces equivalent results in the same period of time. Discontinue the use of the alternative equipment and furnish the specified equipment if the desired results are not achieved.

00216.3. Construction. Perform proof rolling as directed. Adjust the load and tire inflation pressures within the range of the manufacturer's charts or tabulations, as directed. Make at least 2 coverages with the proof roller. Offset each trip of the roller by at most 1 tire width. Operate rollers at a speed between 2 and 6 miles per hour, as directed. If an unstable or nonuniform area is found, correct the area in accordance with the applicable Item.

00216.4. MEASUREMENT AND PAYMENT

A. When listed as a separate contract pay item, shall be measured in accordance with "Measurement and Basis of Payment" section or as shown on the Bid Proposal Form.

B. When not listed as a separate contract pay item, shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

(Referenced from 2004 TxDOT, ITEM 247 Flexible Base – references made to any other Sections of the 2004 TxDOT Manual shall become part of the Contract to be followed)

02601.1. Description. Construct a foundation course composed of flexible base.

02601.2. Materials. Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications. Notify the Engineer of the proposed material sources and of changes to material sources. The Engineer may sample and test project materials at any time before compaction throughout the duration of the project to assure specification compliance. Use Tex-100-E material definitions.

A. Aggregate. Furnish aggregate of the type and grade shown on the plans and conforming to the requirements of Table 1. Each source must meet Table 1 requirements for liquid limit, plasticity index, and wet ball mill for the grade specified. Do not use additives such as but not limited to lime, cement, or fly ash to modify aggregates to meet the requirements of Table 1, unless shown on the plans.

Table 1
Material Requirements

Property	Test Method	Grade 1	Grade 2	Grade 3	Grade 4
Master gradation sieve size (% retained)	Tex-110-E				As shown on the plans
2-1/2 in.		–	0	0	
1-3/4 in.		0	0–10	0–10	
7/8 in.		10–35	–	–	
3/8 in.		30–50	–	–	
No. 4		45–65	45–75	45–75	
No. 40		70–85	60–85	50–85	
Liquid limit, % max.[1]	Tex-104-E	35	40	40	As shown on the plans
Plasticity index, max.[1]	Tex-106-E	10	12	12	As shown on the plans
Plasticity index, min.[1]		As shown on the plans			
Wet ball mill, % max.[2]	Tex-116-E	40	45	–	As shown on the plans
Wet ball mill, % max. increase passing the No. 40 sieve		20	20	–	
Classification[3]	Tex-117-E	1.0	1.1–2.3	–	As shown on the plans
Min. compressive strength[3], psi					As shown on the plans
lateral pressure 0 psi		45	35	–	
lateral pressure 15 psi		175	175	–	

1. Determine plastic index in accordance with Tex-107-E (linear shrinkage) when liquid limit is unattainable as defined in Tex-104-E.

2. When a soundness value is required by the plans, test material in accordance with Tex- 411- A.

3. Meet both the classification and the minimum compressive strength, unless otherwise shown on the plans.

1. Material Tolerances. The Engineer may accept material if no more than 1 of the 5 most recent gradation tests has an individual sieve outside the specified limits of the gradation. When target grading is required by the plans, no single failing test may exceed the master grading by more than 5 percentage points on sieves No. 4 and larger or 3 percentage points on sieves smaller than No. 4.
The Engineer may accept material if no more than 1 of the 5 most recent plasticity index tests is outside the specified limit. No single failing test may exceed the allowable limit by more than 2 points.

2. Material Types. Do not use fillers or binders unless approved. Furnish the type specified on the plans in accordance with the following.

a. Type A. Crushed stone produced and graded from oversize quarried aggregate that originates from a single, naturally occurring source. Do not use gravel or multiple sources.

b. Type B. Crushed or uncrushed gravel. Blending of 2 or more sources is allowed.

c. Type C. Crushed gravel with a minimum of 60% of the particles retained on a No. 4 sieve with 2 or more crushed faces as determined by Tex-460-A, Part I. Blending of 2 or more sources is allowed.

d. Type D. Type A material or crushed concrete. Crushed concrete containing gravel will be considered Type D material. Crushed concrete must meet the requirements in Section 02601.2.A.3.b, "Recycled Material (Including Crushed Concrete) Requirements," and be managed in a way to provide for uniform quality. The Engineer may require separate dedicated stockpiles in order to verify compliance.

e. Type E. As shown on the plans.

3. Recycled Material. Recycled asphalt pavement (RAP) and other recycled materials may be used when shown on the plans. Request approval to blend 2 or more sources of recycled materials.

a. Limits on Percentage. When RAP is allowed, do not exceed 20% RAP by weight unless otherwise shown on the plans. The percentage limitations for other recycled materials will be as shown on the plans.

b. Recycled Material (Including Crushed Concrete) Requirements.

(1) Contractor Furnished Recycled Materials. When the Contractor furnishes the recycled materials, including crushed concrete, the final product will be subject to the requirements of Table 1 for the grade specified. Certify compliance with DMS- 11000, "Evaluating and Using Non-hazardous Recyclable Materials Guidelines," for Contractor furnished recycled materials. In addition, recycled materials must be free from reinforcing steel and other objectionable material and have at most 1.5% deleterious material when tested in accordance with Tex-413-A. For RAP, do not exceed a maximum percent loss from decantation of 5.0% when tested in accordance with Tex-406-A. Test RAP without removing the asphalt.

(2) Department Furnished Required Recycled Materials.
When the Department furnishes and requires the use of recycled materials, unless otherwise shown on the plans:

- Department required recycled material will not be subject to the requirements in Table 1,
- Contractor furnished materials are subject to the requirements in Table 1 and this Item,
- The final product, blended, will be subject to the requirements in Table 1, and
- For final product, unblended (100% Department furnished required recycled material), the liquid limit, plasticity index, wet ball mill, classification, and compressive strength is waived.

Crush Department-furnished RAP so that 100% passes the 2 in. sieve. The Contractor is responsible for uniformly blending to meet the percentage required.

(3) Department Furnished and Allowed Recycled Materials. When the Department furnishes and allows the use of recycled materials or allows the Contractor to furnish recycled materials, the final blended product is subject to the requirements of Table 1 and the plans.

a. Recycled Material Sources. Department-owned recycled material is available to the Contractor only when shown on the plans. Return unused Department-owned recycled materials to the Department stockpile location designated

by the Engineer unless otherwise shown on the plans. The use of Contractor-owned recycled materials is allowed when shown on the plans. Contractor-owned surplus recycled materials remain the property of the Contractor. Remove Contractor-owned recycled materials from the project and dispose of them in accordance with federal, state, and local regulations before project acceptance. Do not intermingle Contractor-owned recycled material with Department-owned recycled material unless approved by the Engineer.

b. **Water.** Furnish water free of industrial wastes and other objectionable matter.

c. **Material Sources.** When non-commercial sources are used, expose the vertical faces of all strata of material proposed for use. Secure and process the material by successive vertical cuts extending through all exposed strata, when directed.

02601.3. Equipment. Provide machinery, tools, and equipment necessary for proper execution of the work. Provide rollers in accordance with Item 210, "Rolling." Provide proof rollers in accordance with Item 216, "Proof Rolling," when required.

02601.4. Construction. Construct each layer uniformly, free of loose or segregated areas, and with the required density and moisture content. Provide a smooth surface that conforms to the typical sections, lines, and grades shown on the plans or as directed. Stockpile base material temporarily at an approved location before delivery to the roadway. Build stockpiles in layers no greater than 2 ft. thick. Stockpiles must have a total height between 10 and 16 ft. unless otherwise shown on the plans. After construction and acceptance of the stockpile, loading from the stockpile for delivery is allowed. Load by making successive vertical cuts through the entire depth of the stockpile. Do not add or remove material from temporary stockpiles that require sampling and testing before delivery unless otherwise approved. Charges for additional sampling and testing required as a result of adding or removing material will be deducted from the Contractor's estimates. Haul approved flexible base in clean trucks. Deliver the required quantity to each 100-ft. station or designated stockpile site as shown on the plans. Prepare stockpile sites as directed. When delivery is to the 100-ft. station, manipulate in accordance with the applicable Items.

A. **Preparation of Subgrade or Existing Base.** Remove or scarify existing asphalt concrete pavement in accordance with Item 105, "Removing Stabilized Base and Asphalt Pavement," when shown on the plans or as

directed. Shape the subgrade or existing base to conform to the typical sections shown on the plans or as directed. When new base is required to be mixed with existing base, deliver, place, and spread the new flexible base in the required amount per station. Manipulate and thoroughly mix the new base with existing material to provide a uniform mixture to the specified depth before shaping. When shown on the plans or directed, proof roll the roadbed in accordance with Item 216, "Proof Rolling," before pulverizing or scarifying. Correct soft spots as directed.

B. Placing. Spread and shape flexible base into a uniform layer with an approved spreader the same day as delivered unless otherwise approved. Construct layers to the thickness shown on the plans. Maintain the shape of the course. Control dust by sprinkling, as directed. Correct or replace segregated areas as directed, at no additional expense to the Department. Place successive base courses and finish courses using the same construction methods required for the first course.

C. Compaction. Compact using density control unless otherwise shown on the plans. Multiple lifts are permitted when shown on the plans or approved. Bring each layer to the moisture content directed. When necessary, sprinkle the material in accordance with Item 204, "Sprinkling." Begin rolling longitudinally at the sides and proceed towards the center, overlapping on successive trips by at least 1/2 the width of the roller unit. On super elevated curves, begin rolling at the low side and progress toward the high side. Offset alternate trips of the roller. Operate rollers at a speed between 2 and 6 mph as directed. Rework, re-compact, and refinish material that fails to meet or that loses required moisture, density, stability, or finish before the next course is placed or the project is accepted. Continue work until specification requirements are met. Perform the work at no additional expense to the Department.

1. **Ordinary Compaction.** Roll with approved compaction equipment as directed. Correct irregularities, depressions, and weak spots immediately by scarifying the areas affected, adding or removing approved material as required, reshaping, and re-compacting.

2. **Density Control.** Compact to at least 100% of the maximum density determined by Tex-113-E unless otherwise shown on the plans. Determine the moisture content of the material at the beginning and during compaction in accordance with Tex-103-E. The Engineer will determine roadway density of completed sections in accordance with Tex-115-E. The Engineer may accept the section if no more than 1 of the 5 most recent density tests

is below the specified density and the failing test is no more than 3 pcf below the specified density.

D. Finishing. After completing compaction, clip, skin, or tight-blade the surface with a maintainer or subgrade trimmer to a depth of approximately 1/4 in. Remove loosened material and dispose of it at an approved location. Seal the clipped surface immediately by rolling with a pneumatic tire roller until a smooth surface is attained. Add small increments of water as needed during rolling. Shape and maintain the course and surface in conformity with the typical sections, lines, and grades as shown on the plans or as directed. In areas where surfacing is to be placed, correct grade deviations greater than 1/4 in. in 16 ft. measured longitudinally or greater than 1/4 in. over the entire width of the cross-section. Correct by loosening, adding, or removing material. Reshape and re-compact in accordance with Section 02601.4.C, "Compaction."

E. Curing. Cure the finished section until the moisture content is at least 2 percentage points below optimum or as directed before applying the next successive course or prime coat.

02601.5. MEASUREMENT AND PAYMENT

A. When listed as a separate contract pay item, shall be measured in accordance with "Measurement and Basis of Payment" section or as shown on the Bid Proposal Form.

B. When not listed as a separate contract pay item, shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

ITEM 247, Flexible Base Parameters

Flexible Base Type E will composed of caliche (argillaceous Limestone, calcareous or calcareous clay particles) and may contain stone, conglomerate, gravel, sand or granular materials when these materials are in situ with the caliche.

Blended material for Flexible Base TY E GR 4

The Contractor may blend base material with another caliche source or with crushed concrete, meeting the requirements for TY "D" materials, provided a minimum of 50% caliche is used. The crushed concrete may contain sand or granular materials. Stabilizing additives will not be allowed in the raw crushed concrete base. Acceptance will be under the following conditions:

Condition One (1): When both components of the blend in their individual stockpiles meet all the physical requirements of this Item, the field blending will be allowed.

Condition Two (2): When only one component of the blend passes the physical requirements of this Item, the materials shall be blended through a plant for stockpile testing and approval.

Flexible Base (TY E GR 4) shall conform to the following requirements:

BEFORE LIME IS ADDED

Retained on Sq. Sieve	Percent Required
2"	0
½"	20-60
No. 4	40-75
No. 40	70-90
Max. PI:	15
Max. Wet Ball PI:	15
Wet Ball Mill Max Amount	50

The Wet Ball Test (Tex-116-E) shall be run and the Plasticity Index of the material passing the No. 40 sieve shall be determined (Wet Ball PI).

After 1% lime (laboratory) is added to unlimed material

Min. Strength Triaxial Class 1. Triaxial Test (Lime Treated)	Tex-121-E

The percent of density as determined by Compaction Ratio (Tex-113-E) for the new Flexible Base shall be a minimum of 98%.

The Contractor's attention is called to the fact that certain existing and/or proposed structures may be within the limits of the Flexible Base. It shall be the Contractor's responsibility to perform construction operations without damage to these structures.

For water added under Item 247, the sulfate content should not exceed 3000-ppm and the chloride content should not exceed 3000-ppm.

Perform base ride quality testing for all base with only one lift of ACP or a seal coat as the final surface in accordance with Engineer's recommendation. Perform base ride quality testing before placing the ACP or seal coat.

SECTION 321216 – ASPHALT PAVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Asphalt Pavements
B. Asphalt Surface Rehabilitation

1.2 RELATED SECTIONS

A. Section 31 23 00 – Excavation and Fill
B. Section 31 22 16 – Fine Grading
C. Section 32 11 00 – Base Courses
D. Section 32 13 13 – Concrete Paving
E. Section 32 16 13 – Curbs and Gutters
F. Section 32 17 23 – Pavement Markings
G. Construction Drawings
H. State Highway Department Standard Specifications

1.3 SUBMITTALS

A. Design Mix: Before any asphaltic concrete paving is constructed, submit actual design mix to the Owner's Construction Department for review and/or approval. Design mix submittal shall follow the format as indicated in the Asphalt Institute Manual MS-2, Mashall Stability Method; and shall include the type/name of the mix gradation analysis, grade of asphalt cement used, Marshall Stability (lbs), flow, effective asphalt content (percent), and direct references to the applicable highway department specifications sections for each material. The design shall be for a mixture listed in the current edition of the applicable state roadway specifications. Mix designs over three (3) years old will not be accepted by the owner.

B. Material Certificates: Submit materials certificate to on-site independent testing laboratory which is signed by material producer and Contactor, certifying that materials comply with, or exceed, the requirements herein.

1.4 JOB CONDITIONS

A. Weather Limitations.

1. Apply prime and tack coats when ambient temperature is above 40°F, and when temperature has been above 35°F for 12 hours immediately prior to application. Do not apply when base is wet, contains excess moisture, or during rain.
2. Construct asphaltic concrete paving when atmospheric temperature is above 40°F.

1.5 REFERENCES

A. MS-2 Mix design methods for asphaltic concrete and other hot Mix types per The Asphalt Institute (AI).

B. MS-3 Asphalt Plant Manual per The Asphalt Institute (AI).

C. Hot Mix Asphalt Paving Handbook per US Army Corp of Engineers, UN-13 (CE MP-ET)

D. MS-10 Basic Asphalt Emulsion Manual per The Asphalt Institute (AI).

E. ASTM D946 – Penetration – Graded Asphalt Cement for use in Pavement Construction.

F. AASHTO M-226/ASTM D3381 Asphalt Cement.

G. AASHTO M-140/ASTM D997 or AASHTO M-208/ASTM D2397 Tack Coat.

H. AASHTO M-117/ASTM D242 Mineral Filler.

I. AASHTO T-245/ASTM D1559 Marshall Mix Design.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide asphalt-aggregate mixture as recommended by local or state paving authorities to suit project conditions. Use locally available materials and gradations which meet state highway Specifications and exhibit satisfactory records of previous installations.

B. Asphalt Cement: Comply with AASHTO M-226/ASTM D3381; Table 2 AC-10, AC-20, or AC-30 viscosity grade, depending on local mean annual air temperature. (See chart below):

Temperature Condition	Asphalt Grades
Cold, mean annual air temperature At 7 degrees C (45 D F) or lower 85/100 pen.	AC-10
Warm, mean annual air temperature between 7 degrees C (45 degrees F) and 60/70 pen. 24 degrees C (75 degrees F)	AC-20
Hot, mean annual air temperature At 24 degrees C (75 degrees F) or higher	AC-30

C. Prime Coat: A medium curing cut-back asphalt or an asphalt penetrating prime coat consisting of either MC-30 or SS-1h.

D. Tack Coat: Emulsified asphalt; AASHTO M-140/ASTM D997 or AASHTO M208/ASTM D2397, SS-1 or CSS-1h, diluted with one part water to one part emulsified asphalt.

E. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with AASHTO M-17/ASTM D242, if recommended by applicable state highway standards.

F. Asphalt-Aggregate Mixture: Unless otherwise noted on the drawings the design mix shall have a minimum stability based on a 50-blow Mashall complying with ASTM D1559 of 1000 lb with a flow between 8 and 16. The Design Mix shall be within the following sieve analysis and bitumen ranges:

SIEVE ANALYSIS OF MIX

Square Sieve	Total % Passing	% Tolerance
1/4”	100	7%
1/2”	80-100%	5%
3/8”	65-93%	4%
#8	40-55%	4%
#50	12-27%	2%
#200	0-10%	0%

Percent bitumen by weight of total mix: 5.0-8.35

Air voids: 3-6% Percent aggregate voids filled with asphalt cement: 70-82%

Allowable variance of percent bitumen by weight of total mix = 0.04

2.2 EQUIPMENT

A. Maintain equipment in satisfactory operating condition and correct breakdown in manner that will not delay or be detrimental to progress of paving operations.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove loose material from compacted base material surface immediately before applying prime coat.

B. Proof roll prepared base material surface to check for areas requiring additional compaction and areas requiring removal and re-compaction.

C. Do not begin paving work until deficient base material areas have been corrected and are ready to receive paving.

D. Remove all dirt and other debris from existing pavement surfaces to be resurfaced, by brooming, blading, or other approved methods. Heat, scarify and rework pavement surface to the widths and elevations shown on the plans. Patch and level pavement surface as is necessary to ensure a final smooth driving surface (refer to 3.05 Paragraph D). Mill edges adjacent to concrete pavement and curbs to the specified depths for a level transition to the new pavement.

3.2 APPLICATIONS

A. Prime Coat:
   1. Apply bituminous prime coat to all base material surfaces where asphaltic concrete paving will be constructed.
   2. Apply bituminous prime coat in accordance with APWA Section 2204 and applicable state highway specifications.
   3. Apply at minimum rate of 0.25 gallon per square yard over compacted base material. Apply to penetrate and seal, but not flood surface.
   4. Make necessary precautions to protect adjacent areas from overspray.
   5. Cure and dry as long as necessary to attain penetration of compacted base and evaporation of volatile substances.

B. Tack Coat:

1. Apply to contact surfaces of previously constructed asphaltic concrete base courses, pavement, and surfaces s butting or projecting into asphaltic concrete or into asphaltic concrete pavement.
2. Apply tack coat to asphaltic concrete base course or sand asphalt base course. Apply emulsified asphalt tack coat between each lift or layer of full depth asphaltic concrete and sand asphalt base and on surface of all such bases where asphaltic concrete paving will be constructed.
3. Apply emulsified asphalt tack coat in accordance with APWA Section 2204 and applicable state highway specifications.
4. Apply at minimum rate of 0.05 gallon per square yard of surface.
5. Allow to dry until at proper condition to receive paving.

3.3 ASPHALTIC CONCRETE PLACEMENT

A. Place asphaltic concrete mixture on completed surface, spread, and strike off. Spread mixture at following minimum temperatures:
   1. When ambient temperature is between 40°F and 50°F, mixture temp. = 285°F
   2. When ambient temperature is between 50°F and 60°F, mixture temp.= 280°F
   3. When ambient temperature is higher than 60°F, mixture temp. = 275°F

B. Whenever possible, all pavements shall be spread by a finishing machine; however, inaccessible irregular areas may be placed by hand methods. The hot mixture shall spread uniformly to the required depth with hot shovels and rakes. After spreading, the hot mixtures shall be carefully smothered to remove all segregated course aggregate and rake marks. Rakes and lutes used for hand spreading shall be of the type designed for use on asphalt mixtures. Loads shall not be dumped faster that they can be properly spread. Workers shall not stand on the loose mixture while spreading.

C. Paving Machine Placement: Apply successive lifts of asphaltic concrete in transverse directions with the surface course placed in the direction of surface-water flow. Place in typical strips not less than 10'-0" wide.

D. Joints: Make joints between old and new pavements, or between successive days and work in a manner that will provide a continuous bond between adjoining works. Construction joints shall have same texture, density, and smoothness as other sections of asphaltic

concrete course. Clean contact surfaces of all joints and apply tack coat.

3.4 ROLLING AND COMPACTION

A. The mixture, after being spread, shall be thoroughly compacted by rolling as soon as it will bear the weight of the rollers without undue displacement. The number, weight and types of rollers and sequences of rolling operations shall be such that the required density and surface are consistently attained while the mixture is in a workable condition.

B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

C. Breakdown Rolling: Accomplished breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling with hot material.

D. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

E. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until/roller marks are eliminated and course has attained maximum density.

F. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot asphaltic concrete. Compact by rolling to maximum surface density and smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled not to become marked.

3.5 FIELD QUALITY CONTROL

A. Independent Testing Laboratory, selected and paid by Owner, shall be retained to perform construction testing on in-placed asphaltic concrete courses for compliance with requirements for thickness, compaction and surface smoothness. Asphaltic surface and base courses shall be randomly cored at a minimum rate of one core for

every 20,000 square feet of paving. However, no less than three (3) cores in light duty areas and three (3) cores in heavy duty areas shall be obtained. Coring holes shall be immediately filled with full-depth asphalt or with concrete. Asphaltic Concrete pavement samples shall be tested for conformance with the mix design.

B. Grade Control: Establish and maintain required lines and elevations.

C. Thickness: In-place compacted thickness shall be not less than thickness specified on the drawings. Areas of deficient paving thickness shall receive a tack coat and a minimum 1" overlay; or shall be removed and replaced to the proper thickness, at the discretion of the Owner; until specified thickness of the course is met or exceeded at no additional expense to the Owner.

D. Surface Smoothness: Testing shall be performed on the finished surface of each asphalt concrete course for smoothness, using 10'-0" straightedge applied parallel with, and at right angles to centerline of paved area. The results of these tests shall be made available to the owner upon request. Surfaces will not be acceptable if the following 10' straightedge tolerances for Smoothness are exceeded:

Base Course Surface:	1/4"
Wearing Course Surface:	3/16"

E. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable paving as directed by Owner.

F. Compaction: Field density test for in place material shall be performed by examination of field cores in accordance with one of the following standards:
   1. Bulk specific gravity of paraffin-coated specimens: ASTM D1188
   2. Bulk specific gravity using saturated surface-dry specimens: ASTM D2726

Rate of testing shall be one core per 20,000 square feet of pavement, with a minimum of three (3) cores from heavy duty areas and three (3) cores from standard-duty areas. Cores shall be cut from areas representative of the project.

Areas of insufficient compaction shall be delineated, removed, and replaced in compliance with the specifications at no expense to the Owner.

END OF SECTION

(Referenced from 2004 TxDOT, ITEM 300 Asphalts, Oils, and Emulsions – references made to any other Sections of the 2004 TxDOT Manual shall become part of the Contract to be followed)

02577.1. Description. Provide asphalt cements, cutback and emulsified asphalts, performance-graded asphalt binders, and other miscellaneous asphalt materials as specified on the plans.

02577.2. Materials. Provide asphalt materials that meet the stated requirements when tested in accordance with the referenced Department, AASHTO, and ASTM test methods. Refer to the Material Inspection Guide (maintained by the Construction Division), Section 11. "Asphalt Inspection, Quality Control and Quality Assurance," for sampling and testing requirements.

Acronyms used in this Item are defined in Table 1.

Table 1
Acronyms

Acronym	Definition
Test Procedure Designations	
Tex	Department
T or R	AASHTO
D	ASTM
Polymer Modifier Designations	
P	polymer-modified
SBR or L	styrene-butadiene rubber (latex)
SBS	styrene-butadiene-styrene block co-polymer
TR	tire rubber (from ambient temperature grinding of truck and passenger tires)
AC	asphalt cement
AE	asphalt emulsion
AE-P	asphalt emulsion prime
A-R	asphalt-rubber
C	cationic
EAP&T	emulsified asphalt prime and tack
H-suffix	harder residue (lower penetration)
HF	high float
MC	medium-curing

Table 1 (continued)
Acronyms

Acronym	Definition
MS	medium-setting
PCE	prime, cure, and erosion control
PG	performance grade
RC	rapid-curing
RS	rapid-setting
S-suffix	stockpile usage
SCM	special cutback material
SS	slow-setting

A. Asphalt Cement. Asphalt cement must be homogeneous, water-free, and non-foaming when heated to 347°F, and must meet Table 2 requirements.

Table 2
Asphalt Cement

Property	Test Procedure	Viscosity Grade									
		AC-0.6		AC-1.5		AC-3		AC-5		AC-10	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity	T 202										
140°F, poise		40	80	100	200	250	350	400	600	800	1,200
275°F, poise		0.4	–	0.7	–	1.1	–	1.4	–	1.9	–
Penetration, 77°F, 100g, 5 sec.	T 49	350	–	250	–	210	–	135	–	85	–
Flash point, C.O.C., °F	T 48	425	–	425	–	425	–	425	–	450	–
Solubility in trichloroethylene, %	T 44	99.0	–	99.0	–	99.0	–	99.0	–	99.0	–
Spot test	Tex-509-C	Neg.		Neg.		Neg.		Neg.		Neg.	
Tests on residue from Thin-Film Oven Test:	T 179										
Viscosity, 140°F, poise	T 202	–	180	–	450	–	900	–	1,500	–	3,000
Ductility[1], 77°F 5 cm/min., cm	T 51	100	–	100	–	100	–	100	–	100	–

1. If AC-0.6 or AC-1.5 ductility at 77°F is less than 100 cm, material is acceptable if ductility at 60°F is more than 100 cm.

B. Polymer-Modified Asphalt Cement. Polymer-modified asphalt cement must be smooth and homogeneous, and comply with the requirements of Table 3. If requested, supply samples of the base asphalt cement and polymer additives.

Table 3
Polymer-Modified Asphalt Cement

Property	Test Procedure	Polymer-Modified Viscosity Grade							
		AC-5 w/2% SBR		AC-10 w/2% SBR		AC-15P		AC-20-5TR	
		Min	Max	Min	Max	Min	Max	Min	Max
Polymer		SBR		SBR		SBS		TR	
Polymer content, % (solids basis)	Tex-533-C	2.0	–	2.0	–	3.0	–	5.0	–
Dynamic shear, G*/sin δ, 64°C, 10 rad/s, kPa	T 315	–	–	–	–	–	–	1.0	–
Viscosity									
140°F, poise	T 202	700	–	1,300	–	1,500	–	2,000	–
275°F, poise	T 202	–	7.0	–	8.0	–	8.0	–	10.0
Penetration, 77°F, 100 g, 5 sec.	T 49	120	–	80	–	100	150	75	115
Ductility, 5cm/min., 39.2°F, cm	T 51	70	–	60	–	–	–	–	–
Elastic recovery, 50°F, %	Tex-539-C	–	–	–	–	55	–	55	–
Softening point, °F	T 53	–	–	–	–	–	–	120	–
Polymer separation, 48 hr.	Tex-540-C	None		None		None		None	
Flash point, C.O.C., °F	T 48	425	–	425	–	425	–	425	–
Tests on residue from Thin-Film Oven Test:	T 179								
Retained penetration ratio, 77°F	T 49	–	–	–	–	0.60	1.00	0.60	1.00
Tests on residue from RTFOT aging and pressure aging:	Tex-541-C and R 28								
Creep stiffness	T 313								
S, -18°C, MPa		–	–	–	–	–	–	–	300
m-value, -18°C		–	–	–	–	–	–	0.300	–

C. Cutback Asphalt. Cutback asphalt must meet the requirements of Tables 4, 5, and 6 for the specified type and grade. If requested, supply samples of the base asphalt cement and polymer additives.

Table 4
Rapid-Curing Cutback Asphalt

Property	Test Procedure	Type–Grade					
		RC-250		RC-800		RC-3000	
		Min	Max	Min	Max	Min	Max
Kinematic viscosity, 140°F, cSt	T 201	250	400	800	1,600	3,000	6,000
Water, %	T 55	–	0.2	–	0.2	–	0.2
Flash point, T.O.C., °F	T 79	80	–	80	–	80	–
Distillation test:	T 78						
Distillate, percentage by volume of total distillate to 680°F							
to 437°F		40	75	35	70	20	55
to 500°F		65	90	55	85	45	75
to 600°F		85	–	80	–	70	–
Residue from distillation, volume %		70	–	75	–	82	–
Tests on distillation residue:							
Penetration, 100 g, 5 sec., 77°F	T 49	80	120	80	120	80	120
Ductility, 5 cm/min., 77°F, cm	T 51	100	–	100	–	100	–
Solubility in trichloroethylene, %	T 44	99.0	–	99.0	–	99.0	–
Spot test	Tex-509-C	Neg.		Neg.		Neg.	

Table 5
Medium-Curing Cutback Asphalt

Property	Test Procedure	Type–Grade							
		MC-30		MC-250		MC-800		MC-3000	
		Min	Max	Min	Max	Min	Max	Min	Max
Kinematic viscosity, 140°F, cSt	T 201	30	60	250	500	800	1,600	3,000	6,000
Water, %	T 55	–	0.2	–	0.2	–	0.2	–	0.2
Flash point, T.O.C., °F	T 79	100	–	150	–	150	–	150	–
Distillation test:	T 78								
Distillate, percentage by volume of total distillate to 680°F									
to 437°F		–	25	–	10	–	–	–	–
to 500°F		40	70	15	55	–	35	–	15
to 600°F		75	93	60	87	45	80	15	75
Residue from distillation, volume %		50	–	67	–	75	–	80	–
Tests on distillation residue:									
Penetration, 100 g, 5 sec., 77°F	T 49	120	250	120	250	120	250	120	250
Ductility, 5 cm/min., 77°F, cm[1]	T 51	100	–	100	–	100	–	100	–
Solubility in trichloroethylene, %	T 44	99.0	–	99.0	–	99.0	–	99.0	–
Spot test	Tex-509-C	Neg.		Neg.		Neg.		Neg.	

1. If the penetration of residue is more than 200 and the ductility at 77°F is less than 100 cm, the material is acceptable if its ductility at 60°F is more than 100 cm.

Table 6
Special-Use Cutback Asphalt

Property	Test Procedure	Type–Grade					
		MC-2400L		SCM I		SCM II	
		Min	Max	Min	Max	Min	Max
Kinematic viscosity, 140°F, cSt	T 201	2,400	4,800	500	1,000	1,000	2,000
Water, %	T 55	–	0.2	–	0.2	–	0.2
Flash point, T.O.C., °F	T 79	150	–	175	–	175	–
Distillation test:	T 78						
Distillate, percentage by volume of total distillate to 680°F							
to 437°F		–	–	–	–	–	–
to 500°F		–	35	–	0.5	–	0.5
to 600°F		35	80	20	60	15	50
Residue from distillation, volume %		78	–	76	–	82	–
Tests on distillation residue:							
Polymer		SBR		–		–	
Polymer content, % (solids basis)	Tex-533-C	2.0	–	–	–	–	–
Penetration, 100 g, 5 sec., 77°F	T 49	150	300	180	–	180	–
Ductility, 5 cm/min., 39.2°F, cm	T 51	50	–	–	–	–	–
Solubility in trichloroethylene, %	T 44	99.0	–	99.0	–	99.0	–

D. Emulsified Asphalt. Emulsified asphalt must be homogeneous, not separate after thorough mixing, and meet the requirements for the specified type and grade in Tables 7, 8, 9, and 10.

Table 7
Emulsified Asphalt

Property	Test Procedure	Type–Grade									
		Rapid-Setting		Medium-Setting				Slow-Setting			
		HFRS-2		MS-2		AES-300		SS-1		SS-1H	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol	T 72										
77°F, sec.		–	–	–	–	75	400	20	100	20	100
122°F, sec.		150	400	100	300	–	–	–	–	–	–
Sieve test, %	T 59	–	0.1	–	0.1	–	0.1	–	0.1	–	0.1
Miscibility	T 59	–		–		–		Pass		Pass	
Cement mixing, %	T 59	–	–	–	–	–	–	–	2.0	–	2.0
Coating ability and water resistance:	T 59										
dry aggregate/after spray		–		–		Good/Fair		–		–	
wet aggregate/after spray		–		–		Fair/Fair		–		–	
Demulsibility, 35 ml of 0.02 N $CaCl_2$, %	T 59	50	–	–	30	–	–	–	–	–	–
Storage stability, 1 day, %	T 59	–	1	–	1	–	1	–	1	–	1
Freezing test, 3 cycles[1]	T 59	–		Pass		–		Pass		Pass	
Distillation test:	T 59										
Residue by distillation, % by wt.		65	–	65	–	65	–	60	–	60	–
Oil distillate, % by volume of emulsion		–	0.5	–	0.5	–	5	–	0.5	–	0.5
Tests on residue from distillation:											
Penetration, 77°F, 100 g, 5 sec.	T 49	100	140	120	160	300	–	120	160	70	100
Solubility in trichloroethylene, %	T 44	97.5	–	97.5		97.5	–	97.5	–	97.5	–
Ductility, 77°F, 5 cm/min., cm	T 51	100	–	100		–	–	100	–	80	–
Float test, 140°F, sec.	T 50	1,200	–	–		1,200	–	–	–	–	–

1. Applies only when the Engineer designates material for winter use.

Table 8
Cationic Emulsified Asphalt

Property	Test Procedure	Type–Grade											
		Rapid-Setting				Medium-Setting				Slow-Setting			
		CRS-2		CRS-2H		CMS-2		CMS-2S		CSS-1		CSS-1H	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol	T 72												
77°F, sec.		–	–	–	–	–	–	–	–	20	100	20	100
122°F, sec.		150	400	150	400	100	300	100	300	–	–	–	–
Sieve test, %	T 59	–	0.1	–	0.1	–	0.1	–	0.1	–	0.1	–	0.1
Cement mixing, %	T 59	–	–	–	–	–	–	–	–	–	2.0	–	2.0
Coating ability and water resistance:	T 59												
dry aggregate/after spray		–		–		Good/Fair		Good/Fair		–		–	
wet aggregate/after spray		–		–		Fair/Fair		Fair/Fair		–		–	
Demulsibility, 35 ml of 0.8% sodium dioctyl sulfosuccinate, %	T 59	70	–	70	–	–	–	–	–	–	–	–	–
Storage stability, 1 day, %	T 59	–	1	–	1	–	1	–	1	–	1	–	1
Particle charge	T 59	Positive		Positive		Positive		Positive		Positive		Positive	
Distillation test:	T 59												
Residue by distillation, % by wt.		65	–	65	–	65	–	65	–	60	–	60	–
Oil distillate, % by volume of emulsion		–	0.5	–	0.5	–	7	–	5	–	0.5	–	0.5
Tests on residue from distillation:													
Penetration, 77°F, 100 g, 5 sec.	T 49	120	160	70	110	120	200	300	–	120	160	70	110
Solubility in trichloroethylene, %	T 44	97.5	–	97.5	–	97.5	–	97.5	–	97.5	–	97.5	–
Ductility, 77°F, 5 cm/min., cm	T 51	100	–	80	–	100	–	–	–	100	–	80	–

Table 9
Polymer-Modified Emulsified Asphalt

Property	Test Procedure	Type-Grade											
		Rapid-Setting				Medium-Setting				Slow-Setting			
		RS-1P		HFRS-2P		AES-150P		AES-300P		AES-300S		SS-1P	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol	T 72												
77°F, sec.		–	–	–	–	75	400	75	400	75	400	30	100
122°F, sec.		50	200	150	400	–	–	–	–	–	–	–	–
Sieve test, %	T 59	–	0.1	–	0.1	–	0.1	–	0.1	–	0.1	–	0.1
Miscibility	T 59	–		–		–		–		–		Pass	
Coating ability and water resistance:	T 59												
dry aggregate/after spray		–		–		Good/Fair		Good/Fair		Good/Fair		–	
wet aggregate/after spray		–		–		Fair/Fair		Fair/Fair		Fair/Fair		–	
Demulsibility, 35 ml of 0.02 N $CaCl_2$, %	T 59	60	–	50	–	–	–	–	–	–	–	–	–
Storage stability, 1 day, %	T 59	–	1	–	1	–	1	–	1	–	1	–	1
Breaking index, g	Tex-542-C	–	80	–	–	–	–	–	–	–	–	–	–
Distillation test:[1]	T 59												
Residue by distillation, % by wt.		65	–	65	–	65	–	65	–	65	–	60	–
Oil distillate, % by volume of emulsion		–	3	–	0.5	–	3	–	5	–	7	–	0.5
Tests on residue from distillation:													
Polymer content, wt. % (solids basis)	Tex-533-C	–	–	3.0	–	–	–	–	–	–	–	3.0	–
Penetration, 77°F, 100 g, 5 sec.	T 49	225	300	90	140	150	300	300	–	300	–	100	140
Solubility in trichloroethylene, %	T 44	97.0	–	97.0	–	97.0	–	97.0	–	97.0	–	97.0	–
Viscosity, 140°F, poise	T 202	–	–	1,500	–	–	–	–	–	–	–	1,300	–
Float test, 140°F, sec.	T 50	–	–	1,200	–	1,200	–	1,200	–	1,200	–	–	–
Ductility[2], 39.2°F, 5 cm/min., cm	T 51	–	–	50	–	–	–	–	–	–	–	50	–
Elastic recovery[2], 50°F, %	Tex-539-C	55	–	55	–	–	–	–	–	–	–	–	–
Tests on RTFO curing of distillation residue	Tex-541-C												
Elastic recovery, 50°F, %	Tex-539-C	–	–	–	–	50	–	50	–	30	–	–	–

1. Exception to T 59: Bring the temperature on the lower thermometer slowly to 350°F ±10°F. Maintain at this temperature for 20 min. Complete total distillation in 60 ±5 min. from the first application of heat.
2. HFRS-2P must meet one of either the ductility or elastic recovery requirements.

Table 10
Polymer-Modified Cationic Emulsified Asphalt

Property	Test Procedure	Type-Grade					
		Rapid-Setting				Slow-Setting	
		CRS-1P		CRS-2P		CSS-1P	
		Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol	T 72						
77°F, sec.		–	–	–	–	20	100
122°F, sec.		50	150	150	400	–	–
Sieve test, %	T 59	–	0.1	–	0.1	–	0.1
Demulsibility, 35 ml of 0.8% sodium dioctyl sulfosuccinate, %	T 59	60	–	70	–	–	–
Storage stability, 1 day, %	T 59	–	1	–	1	–	1
Breaking index, g	Tex-542-C	–	80	–	–	–	–
Particle charge	T 59	Positive		Positive		Positive	
Distillation test:[1]	T 59						
Residue by distillation, % by weight		65	–	65	–	62	–
Oil distillate, % by volume of emulsion		–	3	–	0.5	–	0.5
Tests on residue from distillation:							
Polymer content, wt. % (solids basis)	Tex-533-C	–	–	3.0	–	3.0	–
Penetration, 77°F, 100 g, 5 sec.	T 49	225	300	90	150	55	90
Viscosity, 140°F, poise	T 202	–	–	1,300	–	–	–
Solubility in trichloroethylene, %	T 44	97.0	–	97.0	–	97.0	–
Softening point, °F	T 53	–	–	–	–	135	–
Ductility, 77°F, 5 cm/min., cm	T 51	–	–	–	–	70	–
Ductility[2], 39.2°F, 5 cm/min., cm	T 51	–	–	50	–	–	–
Elastic recovery[2], 50°F, %	Tex-539-C	45	–	55	–	–	–

1. Exception to T 59: Bring the temperature on the lower thermometer slowly to 350°F ±0°F. Maintain at this temperature for 20 min. complete total distillation in 60 ±5 min. from the first application of heat.
2. CRS-2P must meet one of either the ductility or elastic recovery requirements.

E. Specialty Emulsions. Specialty emulsions may be either asphalt-based or resin-based and must meet the requirements of Table 11.

Table 11
Specialty Emulsions

Property	Test Procedure	Type–Grade					
		Medium-Setting				Slow-Setting	
		AE–P		EAP&T		PCE[1]	
		Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol	T 72						
77°F, sec.		–	–	–	–	10	100
122°F, sec.		15	150	–	–	–	–
Sieve test, %	T 59	–	0.1	–	0.1	–	0.1
Miscibility[2]	T 59	–		Pass		Pass	
Demulsibility, 35 ml of 0.10 N $CaCl_2$, %	T 59	–	70	–	–	–	–
Storage stability, 1 day, %	T 59	–	1	–	1	–	–
Particle size[5], % by volume < 2.5 µm	Tex-238-F[3]	–	–	90	–	90	–
Asphalt emulsion distillation to 500°F followed by Cutback asphalt distillation of residue to 680°F:	T 59 & T 78						
Residue after both distillations, % by wt.		40	–	–	–	–	–
Total oil distillate from both distillations, % by volume of emulsion		25	40	–	–	–	–
Residue by distillation, % by wt.	T 59	–	–	60	–	–	–
Residue by evaporation[4], % by wt.	T 59	–	–	–	–	60	–
Tests on residue after all distillation(s):							
Viscosity, 140°F, poise	T 202	–	–	800	–	–	–
Kinematic viscosity[5], 140°F, cSt	T 201	–	–	–	–	100	350
Flash point C.O.C., °F	T 48	–	–	–	–	400	–
Solubility in trichloroethylene, %	T 44	97.5	–	–	–	–	–
Float test, 122°F, sec.	T 50	50	200	–	–	–	–

1. Supply with each shipment of PCE: a) a copy of a lab report from an approved analytical lab, signed by a lab official, indicating the PCE formulation does not meet any characteristics of a Resource Conservation Recovery Act (RCRA) hazardous waste; b) a certification from the producer that the formulation supplied does not differ from the one tested and that no listed RCRA hazardous wastes or PCBs have been mixed with the product; and c) a Material Safety Data Sheet.
2. Exception to T 59: In dilution, use 350 ml of distilled or deionized water and a 1,000-ml beaker.
3. Use Tex-238-F, beginning at "Particle Size Analysis by Laser Diffraction," with distilled or deionized water as a medium and no dispersant, or use another approved method.
4. Exception to T 59: Leave sample in the oven until foaming ceases, then

cool and weigh.

5. PCE must meet either the kinematic viscosity requirement or the particle size requirement.

F. Recycling Agent. Recycling agent and emulsified recycling agent must meet the requirements in Table 12. Additionally, recycling agent and residue from emulsified recycling agent, when added in the specified proportions to the recycled asphalt, must meet the properties specified on the plans.

Table 12
Recycling Agent and Emulsified Recycling Agent

Property	Test Procedure	Recycling Agent		Emulsified Recycling Agent	
		Min	Max	Min	Max
Viscosity, Saybolt Furol, 77°F, sec.	T 72	–	–	15	100
Sieve test, %	T 59	–	–	–	0.1
Miscibility[1]	T 59	–		No coagulation	
Residue by evaporation[2], % by wt.	T 59	–	–	60	–
Tests on recycling agent or residue from evaporation:					
Flash point, C.O.C., °F	T 48	400	–	400	–
Kinematic viscosity,	T 201				
140°F, cSt		75	200	75	200
275°F, cSt		–	10.0	–	10.0

1. Exception to T 59: Use 0.02 N CaCl2 solutions in place of water.
2. Exception to T 59: Maintain sample at 300°F until foaming ceases, then cool and weigh.

G. Crumb Rubber Modifier. Crumb rubber modifier (CRM) consists of automobile and truck tires processed by ambient temperature grinding. CRM must be: free from contaminants including fabric, metal, and mineral and other non-rubber substances; free-flowing; and non-foaming

When added to hot asphalt binder. When tested in accordance with Tex-200-F, Part I, using a 50-g sample, the rubber gradation must meet the requirements of the grades in Table 13.

Table 13
CRM Gradations

Sieve Size (% Passing)	Grade A		Grade B		Grade C		Grade D	Grade E
	Min	Max	Min	Max	Min	Max		
#8	100	–	–	–	–	–	As shown on the plans	As approved
#10	95	100	100	–	–	–		
#16	–	–	70	100	100	–		
#30	–	–	25	60	90	100		
#40	–	–	–	–	45	100		
#50	0	10	–	–	–	–		
#200	–	–	0	5	–	–		

H. Crack Sealer. Polymer modified asphalt-emulsion crack sealer must meet the requirements of Table 14. Rubber-asphalt crack sealer must meet the requirements of Table 15.

Table 14
Polymer-Modified Asphalt Emulsion Crack Sealer

Property	Test Procedure	Min	Max
Rotational viscosity, 77°F, cP	D 2196, Method A	10,000	25,000
Sieve test, %	T 59	–	0.1
Storage stability, 1 day, %	T 59	–	1
Evaporation Residue by evaporation, % by wt.	Tex-543-C	 65	 –
Tests on residue from evaporation: Penetration, 77°F, 100 g, 5 sec. Softening point, °F Ductility, 39.2°F, 5 cm/min., cm	 T 49 T 53 T 51	 35 140 100	 75 – –

Table 15
Rubber-Asphalt Crack Sealer

Property	Test Procedure	Class A		Class B	
		Min	Max	Min	Max
CRM content, Grade A or B, % by wt.	Tex-544-C	22	26	–	–
CRM content, Grade B, % by wt.	Tex-544-C	–	–	13	17
Virgin rubber content[1], % by wt.		–	–	2	–
Flash point[2], COC, °F	T 48	400	–	400	–
Penetration[3], 77°F, 150 g, 5 sec.	T 49	30	50	30	50
Penetration[3], 32°F, 200 g, 60 sec.	T 49	12	–	12	–
Softening point, °F	T 53	–	–	170	–
Bond[4]	D5329	–		Pass	

1. Provide certification that the min. % virgin rubber was added.
2. Before passing the test flame over the cup, agitate the sealing compound with a 3/8- to 1/2-in. (9.5- to 12.7-mm) wide, square-end metal spatula in a manner so as to bring the material on the bottom of the cup to the surface, i.e., turn the material over. Start at one side of the thermometer, move around to the other, and then return to the starting point using 8 to 10 rapid circular strokes. Accomplish agitation in 3 to 4 sec. Pass the test

flame over the cup immediately after stirring is completed.

3. Exception to T 49: Substitute the cone specified in ASTM D 217 for the penetration needle.
4. No crack in the crack sealing materials or break in the bond between the sealer and the mortar blocks over 1/4 in. deep for any specimen after completion of the test.

I. Asphalt-Rubber Binders. Asphalt-rubber (A-R) binders are mixtures of asphalt binder and CRM, which have been reacted at elevated temperatures. The A-R binders meet D 6114 and contain a minimum of 15% CRM by weight. Types I or II, containing CRM Grade C, are used for hot mixed aggregate mixtures. Types II or III, containing CRM Grade B, are used for surface treatment binder. Table 16 describes required binder properties.

Table 16
A-R Binders

Property	Test Procedure	Binder Type					
		Type I		Type II		Type III	
		Min	Max	Min	Max	Min	Max
Apparent viscosity, 347°F, cP	D 2196, Method A	1,500	5,000	1,500	5,000	1,500	5,000
Penetration, 77°F, 100 g, 5 sec.	T 49	25	75	25	75	50	100
Penetration, 39.2°F, 200 g, 60 sec.	T 49	10	–	15	–	25	–
Softening point, °F	T 53	135	–	130	–	125	–
Resilience, 77°F, %	D 5329	25	–	20	–	10	–
Flash point, C.O.C., °F	T 48	450	–	450	–	450	–
Tests on residue from Thin-Film Oven Test: Retained penetration ratio, 39.2°F, 200 g, 60 sec., % of original	T 179 T 49	75	–	75	–	75	–

J. Performance-Graded Binders. PG binders must be smooth and homogeneous, show no separation when tested in accordance with Tex-540-C, and meet Table 17 requirements.

Separation testing is not required if:

- a modifier is introduced separately at the mix plant either by injection in the asphalt line or mixer,
- the binder is blended on site in continuously agitated tanks, or binder acceptance is based on field samples taken from an in-line sampling port at the hot mix plant after the addition of modifiers.

Table 17
Performance-Graded Binders

Property and Test Method	Performance Grade																		
	PG 58			PG 64				PG 70				PG 76				PG 82		
	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28
Average 7-day max pavement design temperature, °C[1]	< 58			< 64				< 70				< 76				< 82		
Min pavement design temperature, °C[1]	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28
ORIGINAL BINDER																		
Flash point, T 48, Min, °C	230																	
Viscosity, T 316:[2,3] Max, 3.0 Pa·s, test temperature, °C	135																	
Dynamic shear, T 315:[4] G*/sin(δ), Min, 1.00 kPa Test temperature @ 10 rad/sec., °C	58			64				70				76				82		
Elastic recovery, D 6084, 50°F, % Min	–	–	30	–	–	30	50	–	30	50	60	30	50	60	70	50	60	70
ROLLING THIN-FILM OVEN (Tex-541-C)																		
Mass loss, Tex-541-C, Max, %	1.0																	
Dynamic shear, T 315: G*/sin(δ), Min, 2.20 kPa Test temperature @ 10 rad/sec., °C	58			64				70				76				82		
PRESSURE AGING VESSEL (PAV) RESIDUE (R 28)																		
PAV aging temperature, °C	100																	
Dynamic shear, T 315: G*/sin(δ), Max, 5000 kPa Test temperature @ 10 rad/sec., °C	25	22	19	28	25	22	19	28	25	22	19	28	25	22	19	28	25	22

Table 17 (continued)
Performance-Graded Binders

Property and Test Method	Performance Grade																	
	PG 58			PG 64				PG 70				PG 76				PG 82		
	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28
Average 7-day max pavement design temperature, °C[1]	< 58			< 64				< 70				< 76				< 82		
Min pavement design temperature, °C[1]	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28
Creep stiffness, T 313:[5,6] *S*, max, 300 MPa, *m*-value, min, 0.300 Test temperature @ 60 sec., °C	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18
Direct tension, T 314:[5] Failure strain, min, 1.0% Test temperature @ 1.0 mm/min., °C	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18

1. Pavement temperatures are estimated from air temperatures using an algorithm contained in a Department-supplied computer program, may be provided by the Department, or by following the procedures outlined in AASHTO MP 2 and PP 28.

2. This requirement may be waived at the Department's discretion if the supplier warrants that the asphalt binder can be adequately pumped, mixed, and compacted at temperatures that meet all applicable safety, environmental, and constructability requirements. At test temperatures where the binder is a Newtonian fluid, any suitable standard means of viscosity measurement may be used, including capillary (T 201 or T 202) or rotational viscometry (T 316).

3. Viscosity at 135°C is an indicator of mixing and compaction temperatures that can be expected in the lab and field. High values may indicate high mixing and compaction temperatures. Additionally, significant variation can occur from batch to batch. Contractors should be aware that variation could significantly impact their mixing and compaction operations. Contractors are therefore responsible for addressing any constructability issues that may arise.

4. For quality control of unmodified asphalt binder production, measurement of the viscosity of the original asphalt binder may be substituted for dynamic shear measurements of G*/sin(δ) at test temperatures where the asphalt is a Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary (T 201 or T 202) or rotational viscometry (T 316).

5. Silicone beam molds, as described in AASHTO TP 1-93, are acceptable for use.

6. If creep stiffness is below 300 MPa, direct tension test is not required. If creep stiffness is between 300 and 600 MPa, the direct tension failure strain requirement can be used instead of the creep stiffness requirement. The m-value requirement must be satisfied in both cases.

02577.3. Equipment. Provide all equipment necessary to transport, store, sample, heat, apply, and incorporate asphalts, oils, and emulsions.

02577.4. Construction.

A. Typical Material Use. Table 18 shows typical materials used for specific applications. These are typical uses only. Circumstances may require use of other material.

Table 18
Typical Material Use

Material Application	Typically Used Materials
Hot-mixed, hot-laid asphalt mixtures	PG binders, A-R binders Types I and II
Surface treatment	AC-5, AC-10, AC-5 w/2% SBR, AC-10 w/2% SBR, AC-15P, AC-20-5TR, HFRS-2, MS-2, CRS-2, CRS-2H, HFRS-2P, CRS-2P, A-R binders Types II and III
Surface treatment (cool weather)	RS-1P, CRS-1P, RC-250, RC-800, RC-3000, MC-250, MC-800, MC-3000, MC-2400L
Precoating	AC-5, AC-10, PG 64-22, SS-1, SS-1H, CSS-1, CSS-1H
Tack coat	PG Binders, SS-1H, CSS-1H, EAP&T
Fog seal	SS-1, SS-1H, CSS-1, CSS-1H
Hot-mixed, cold-laid asphalt mixtures	AC-0.6, AC-1.5, AC-3, AES-300, AES-300P, CMS-2, CMS-2S
Patching mix	MC-800, SCM I, SCM II, AES-300S
Recycling	AC-0.6, AC-1.5, AC-3, AES-150P, AES-300P, recycling agent, emulsified recycling agent
Crack sealing	SS-1P, polymer mod AE crack sealant, rubber asphalt crack sealers (Class A, Class B)
Microsurfacing	CSS-1P
Prime	MC-30, AE-P, EAP&T, PCE
Curing membrane	SS-1, SS-1H, CSS-1, CSS-1H, PCE
Erosion control	SS-1, SS-1H, CSS-1, CSS-1H, PCE

B. Storage and Application Temperatures. Use storage and application temperatures in accordance with Table 19. Store and apply materials at

the lowest temperature yielding satisfactory results. Follow the manufacturer's instructions for any agitation requirements in storage. Manufacturer's instructions regarding recommended application and storage temperatures supersede those of Table 19.

Table 19
Storage and Application Temperatures

Type–Grade	Application		Storage Maximum (°F)
	Recommended Range, °F	Maximum Allowable (°F)	
AC-0.6, AC-1.5, AC-3	200–300	350	350
AC-5, AC-10	275–350	350	350
AC-5 w/2% SBR, AC-10 w/2% SBR, AC-15P, AC-20-5TR	300–375	375	360
RC-250	125–180	200	200
RC-800	170–230	260	260
RC-3000	215–275	285	285
MC-30, AE-P	70–150	175	175
MC-250	125–210	240	240
MC-800, SCM I, SCM II	175–260	275	275
MC-3000, MC-2400L	225–275	290	290
HFRS-2, MS-2, CRS-2, CRS-2H, HFRS-2P, CRS-2P, CMS-2, CMS-2S, AES-300, AES-300S, AES-150P, AES-300P	120–160	180	180
SS-1, SS-1H, CSS-1, CSS-1H, PCE, EAP&T, SS-1P, RS-1P, CRS-1P, CSS-1P, recycling agent, emulsified recycling agent, polymer mod AE crack sealant	50–130	140	140
PG binders	275–350	350	350
Rubber asphalt crack sealers (Class A, Class B)	350–375	400	–
A-R binders Types I, II, and III	325–425	425	425

02577.5. MEASUREMENT AND PAYMENT

A. When listed as a separate contract pay item, shall be measured in accordance with "Measurement and Basis of Payment" section or as shown on the Bid Proposal Form.

B. When not listed as a separate contract pay item, shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

(Referenced from 2004 TxDOT, ITEM 340 Dense-Graded Hot-Mix Asphalt (Method) – references made to any other Sections of the 2004 TxDOT Manual shall become part of the Contract to be followed)

02612.1. Description. Construct a pavement layer composed of a compacted, dense-graded mixture of aggregate and asphalt binder mixed hot in a mixing plant.

02612.2. Materials. Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications. Notify the Engineer of all material sources. Notify the Engineer before changing any material source or formulation. When the Contractor makes a source or formulation change, the Engineer will verify that the requirements of this Item are met and may require a new laboratory mixture design, trial batch, or both. The Engineer may sample and test project materials at any time during the project to verify compliance.

A. Aggregate. Furnish aggregates from sources that conform to the requirements shown in Table 1, and as specified in this Section, unless otherwise shown on the plans. Provide aggregate stockpiles that meet the definition in this Section for either coarse aggregate or fine aggregate. When reclaimed asphalt pavement (RAP) is allowed by plan note, provide RAP stockpiles in accordance with this Section. Aggregate from RAP is not required to meet Table 1 requirements unless otherwise shown on the plans. Supply mechanically crushed gravel or stone aggregates that meet the definitions in Tex-100-E. The Engineer will designate the plant or the quarry as the sampling location. Samples must be from materials produced for the project. The Engineer will establish the surface aggregate classification (SAC) and perform Los Angeles abrasion, magnesium sulfate soundness, and Micro-Deval tests. Perform all other aggregate quality tests listed in Table 1. Document all test results on the mixture design report. The Engineer may perform tests on independent or split samples to verify Contractor test results. Stockpile aggregates for each source and type separately. Determine aggregate gradations for mixture design and production testing based on the washed sieve analysis given in Tex-200-F, Part II. Do not add material to an approved stockpile from sources that do not meet the aggregate quality requirements of the Department's *Bituminous Rated Source Quality Catalog* (BRSQC) unless otherwise approved.

1. **Coarse Aggregate.** Coarse aggregate stockpiles must have no more than 20% material passing the No. 8 sieve. Provide aggregates from sources listed in the BRSQC. Provide aggregate from nonlisted sources only when tested by the Engineer and approved before use. Allow 30 calendar days for the Engineer to sample, test, and report results for nonlisted sources. Provide coarse aggregate with at least the minimum SAC shown on the plans. SAC requirements apply only to aggregates used on the surface of travel lanes, unless otherwise shown on the plans. The SAC for sources on the Department's AQMP is listed in the BRSQC.

   Class B aggregate meeting all other requirements in Table 1 may be blended with blending Class A and B aggregates to meet a Class A requirement, ensure that at least 50% by weight of the material retained on the No. 4 sieve comes from the Class A aggregate source. Blend by volume if the bulk specific gravities of the Class A and B aggregates differ by more than 0.300. When blending, do not use Class C or D aggregates. For blending purposes, coarse aggregate from RAP will be considered as Class B aggregate.

2. **RAP.** RAP is salvaged, milled, pulverized, broken, or crushed asphalt pavement. Crush or break RAP so that 100% of the particles pass the 2-in. sieve.

   RAP from either Contractor- or Department-owned sources, including RAP generated during the project, is permitted only when shown on the plans. Department-owned RAP, if allowed for use, will be available at the location shown on the plans. When RAP is used, determine asphalt content and gradation for mixture design purposes. Perform other tests on RAP when shown on the plans.

   When RAP is allowed by plan note, use no more than 30% RAP in Type A or B mixtures unless otherwise shown on the plans. For all other mixtures, use no more than 20% RAP unless otherwise shown on the plans.

   Do not use RAP contaminated with dirt or other objectionable materials. Do not use the RAP if the decantation value exceeds 5% and the plasticity index is greater than 8. Test the stockpiled RAP for decantation in accordance with the laboratory method

given in Tex-406-A, Part I. Determine the plasticity index using Tex-106-E if the decantation value exceeds 5%. The decantation and plasticity index requirements do not apply to RAP samples with asphalt removed by extraction. Do not intermingle Contractor-owned RAP stockpiles with Department-owned RAP stockpiles. Remove unused Contractor-owned RAP material from the project site upon completion of the project. Return unused Department-owned RAP to the designated stockpile location.

3. Fine Aggregate. Fine aggregates consist of manufactured sands, screenings, and field sands. Fine aggregate stockpiles must meet the gradation requirements in Table 2. Supply fine aggregates that are free from organic impurities. The Engineer may test the fine aggregate in accordance with Tex-408-A to verify the material is free from organic impurities. At most 15% of the total aggregate may be field sand or other uncrushed fine aggregate. With the exception of field sand, use fine aggregate from coarse aggregate sources hat meet the requirements shown in Table 1, unless otherwise approved.

If 10% or more of the stockpile is retained on the No. 4 sieve, test the stockpile and verify that it meets the requirements in Table 1 for coarse aggregate angularity (Tex-460-A) and flat and elongated particles (Tex-280-F).

Table 1 Aggregate Quality Requirements

Property	Test Method	Requirement
Coarse Aggregate		
SAC	AQMP	As shown on plans
Deleterious material, %, max	Tex-217-F, Part I	1.5
Decantation, %, max	Tex-217-F, Part II	1.5
Micro-Deval abrasion, %, max	Tex-461-A	Note 1
Los Angeles abrasion, %, max	Tex-410-A	40

Magnesium sulfate soundness, 5 cycles, %, max	Tex-411- A	302
Coarse aggregate angularity, 2 crushed faces, %, min	Tex 460- A, Part I	853
Flat and elongated particles @ 5:1, %, max	Tex-280- F	10
Fine Aggregate		
Linear shrinkage, %, max	Tex-107- E	3
Combined Aggregate4		
Sand equivalent, %, min	Tex-203-F	45

a. Not used for acceptance purposes. Used by the Engineer as an indicator of the need for further investigation.
b. Unless otherwise shown on the plans.
c. Unless otherwise shown on the plans. Only applies to crushed gravel.
d. Aggregates, without mineral filler, RAP, or additives, combined as used in the job-mix formula (JMF).

Table 2 Gradation Requirements for Fine Aggregate

Sieve Size	% Passing by Weight or Volume
3/8"	100
#8	70–100
#200	0–30

B. Mineral Filler. Mineral filler consists of finely divided mineral matter such as agricultural lime, crusher fines, hydrated lime, cement, or fly ash. Mineral filler is allowed unless otherwise shown on the plans. Do not use more than 2% hydrated lime or cement, unless otherwise shown on the plans. The plans may require or disallow specific mineral fillers. When used, provide mineral filler that:

- is sufficiently dry, free-flowing, and free from clumps and foreign

matter;

- does not exceed 3% linear shrinkage when tested in accordance with Tex-107-E; and
- meets the gradation requirements in Table 3.

Table 3 Gradation Requirements for Mineral Filler

Sieve Size	% Passing by Weight or Volume
#8	100
#200	55–100

C. Baghouse Fines. Fines collected by the baghouse or other dust-collecting equipment may be reintroduced into the mixing drum.

D. Asphalt Binder. Furnish the type and grade of performance-graded (PG) asphalt binder specified on the plans in accordance with Section 300.2.J, "Performance-Graded Binders."

E. Tack Coat. Unless otherwise shown on the plans or approved, furnish CSS-1H, SS-1H, or a PG binder with a minimum high-temperature grade of PG 58 for tack coat binder in accordance with Item 300, "Asphalts, Oils, and Emulsions."

Do not dilute emulsified asphalts at the terminal, in the field, or at any other location before use. If required, verify that emulsified asphalt proposed for use meets the minimum residual asphalt percentage specified in Item 300, "Asphalts, Oils, and Emulsions."

The Engineer will obtain at least 1 sample of the tack coat binder per project and test it to verify compliance with Item 300. The Engineer will obtain the sample from the asphalt distributor immediately before use.

F. Additives. When shown on the plans, use the type and rate of additive specified. Other additives that facilitate mixing or improve the quality of the mixture may be allowed when approved.

If lime or a liquid antistripping agent is used, add in accordance with Item 301, "Asphalt Antistripping Agents." Do not add lime directly into the mixing drum of any plant where lime is removed through the exhaust stream unless the plant has a baghouse or dust collection system that reintroduces the lime back into the drum.

02612.3. Equipment. Provide required or necessary equipment in accordance with Item 320, "Equipment for Asphalt Concrete Pavement."

02612.4. Construction. Design, produce, store, transport, place, and compact the specified paving mixture in accordance with the requirements of this Item. Unless otherwise shown on the plans, provide the mix design. The Department will perform quality assurance (QA) testing. Provide quality control (QC) testing as needed to meet the requirements of this Item.

A. Mixture Design.

1. Design Requirements. Use a Level II specialist certified by a Department- approved hot-mix asphalt certification program to develop the mixture design. Have the Level II specialist sign the design documents. Unless otherwise shown on the plans, use the typical weight design example given in Tex-204-F, Part I, to design a mixture meeting the requirements listed in Tables 1 through 6. Use an approved laboratory to perform the Hamburg Wheel test and provide results with the mixture design, or provide the laboratory mixture and request that the Department perform the Hamburg Wheel test. The Construction Division maintains a list of approved laboratories. Furnish the Engineer with representative samples of all materials used in the mixture design. The Engineer will verify the mixture design. If the design cannot be verified by the Engineer, furnish another mixture design.

The Contractor may submit a new mixture design at any time during the project. The Engineer will approve all mixture designs before the Contractor can begin production. Provide the Engineer with a mixture design report using Department-provided software. Include the following items in the report:

- the combined aggregate gradation, source, specific gravity, and percent of each material used;
- results of all applicable tests;
- the mixing and molding temperatures;
- the signature of the Level II person or persons who performed the design;
- the date the mixture design was performed; and
- a unique identification number for the mixture design.

Table 4 Master Gradation Bands (% Passing by Weight or Volume) and Volumetric Properties

Sieve Size	A Coarse Base	B Fine Base	C Coarse Surface	D Fine Surface	F Fine Mixture
1-1/2"	98.0–100.0	–	–	–	–
1"	78.0–94.0	98.0–100.0	–	–	–
3/4"	64.0–85.0	84.0–98.0	95.0–100.0	–	–
1/2"	50.0–70.0	–	–	98.0–100.0	–
3/8"	–	60.0–80.0	70.0–85.0	85.0–100.0	98.0–100.0
#4	30.0–50.0	40.0–60.0	43.0–63.0	50.0–70.0	80.0–86.0
#8	22.0–36.0	29.0–43.0	32.0–44.0	35.0–46.0	38.0–48.0
#30	8.0–23.0	13.0–28.0	14.0–28.0	15.0–29.0	12.0–27.0
#50	3.0–19.0	6.0–20.0	7.0–21.0	7.0–20.0	6.0–19.0
#200	2.0–7.0	2.0–7.0	2.0–7.0	2.0–7.0	2.0–7.0
Design VMA1, % Minimum					
–	12.0	13.0	14.0	15.0	16.0
Plant-Produced VMA, % Minimum					
–	11.0	12.0	13.0	14.0	15.0

1. Voids in Mineral Aggregates.

Table 5 Laboratory Mixture Design Properties

Property	Test Method	Requirement
Target laboratory-molded density, %	Tex-207-F	96.01
Tensile strength (dry), psi (molded to 93% ±1% density)	Tex-226-F	85–2002
Boil test3	Tex-530-C	–

1. Unless otherwise shown on the plans.
2. May exceed 200 psi when approved and may be waived when approved.
3. Used to establish baseline for comparison to production results. May be waived when approved.

Table 6 Hamburg Wheel Test Requirements

High-Temperature Binder Grade	Minimum # of Passes2 @ 0.5" Rut Depth, Tested @122°F
PG 64 or lower	10,000
PG 70	15,000
PG 76 or higher	20,000

1. Tested in accordance with Tex-242-F.
2. May be decreased or waived when shown on the plans.

B. Job-Mix Formula Approval. The job-mix formula (JMF) is the combined aggregate gradation and target asphalt percentage used to establish target values for mixture production. JMF is the original laboratory mixture design used to produce the trial batch. The Engineer and the Contractor will verify JMF based on plant-produced mixture from the trial batch unless otherwise approved. The Engineer may accept an existing mixture design previously used on a Department project and may waive the trial batch to verify JMF. If the JMF is not verified by the Engineer from the trial batch, adjust the JMF or redesign the mix and produce as many trial batches as necessary to verify the JMF.

Provide the Engineer with split samples of the mixtures and blank samples used to determine the ignition oven correction factors. The Engineer will determine the aggregate and asphalt correction factors from the ignition oven using Tex-236-F.

The Engineer will use a Texas gyratory compactor calibrated in accordance with Tex-914-F in molding production samples. The Engineer will perform Tex-530-C and retain the tested sample for comparison purposes during production. The Engineer may waive the requirement for the boil test.

C. JMF Field Adjustments. Produce a mixture of uniform composition closely conforming to the approved JMF. If during initial days of production, the Contractor or Engineer determines that adjustments to the JMF are necessary to achieve the specified requirements, or to more nearly match the aggregate production, the Engineer may allow adjustment of the JMF within the tolerances of Table 7 without a laboratory redesign of the mixture.

The Engineer will adjust the asphalt content to maintain desirable laboratory density near the optimum value while achieving other mix requirements.

Table 7 Operational Tolerances

Description	Test Method	Allowable Difference from JMF Target
Individual % retained for #8 sieve and larger		±5.01
Individual % retained for sieves smaller than #8 and larger than #200	Tex-200-F or Tex-236-F	±3.01
% passing the #200 sieve		±2.01
Asphalt content, %	Tex-236-F	±0.31
Laboratory-molded density, %		±1.0
VMA, %, min	Tex-207-F	Note 2

1. When within these tolerances, mixture production gradations may fall outside the master grading limits; however, the percent passing the #200 sieve will be considered out of tolerance when outside the master grading limits.
2. Test and verify that Table 4 requirements are met.

D. Production Operations. Perform a new trial batch when the plant or plant location is changed. The Engineer may suspend production for noncompliance with this Item. Take corrective action and obtain approval to proceed after any production suspension for noncompliance.

1. Operational Tolerances. During production, do not exceed the operational tolerances in Table 7. Stop production if testing indicates tolerances are exceeded on:

- 3 consecutive tests on any individual sieve,
- 4 consecutive tests on any of the sieves, or
- 2 consecutive tests on asphalt content. Begin production only when test results or other information indicate, to the satisfaction of the Engineer, that the next mixture produced will be within Table 7 tolerances.

1. **Storage and Heating of Materials.** Do not heat the asphalt binder above the temperatures specified in Item 300, "Asphalts, Oils, and

Emulsions" or outside the manufacturer's recommended values. On a daily basis, provide the Engineer with the records of asphalt binder and hot-mix asphalt discharge temperatures in accordance with Item 320, "Equipment for Asphalt Concrete Pavement." Unless otherwise approved, do not store mixture for a period long enough to affect the quality of the mixture, nor in any case longer than 12 hr.

2. **Mixing and Discharge of Materials.** Notify the Engineer of the target discharge temperature and produce the mixture within 25°F of the target. Monitor the temperature of the material in the truck before shipping to ensure that it does not exceed 350°F. The Department will not pay for or allow placement of any mixture produced at more than 350°F. Control the mixing time and temperature so that substantially all moisture is removed from the mixture before discharging from the plant.

E. Hauling Operations. Before use, clean all truck beds to ensure mixture is not contaminated. When a release agent is necessary to coat truck beds, use a release agent on the approved list maintained by the Construction Division.

F. Placement Operations. Prepare the surface by removing raised pavement markers and objectionable material such as moisture, dirt, sand, leaves, and other loose impediments from the surface before placing mixture. Remove vegetation from pavement edges. Place the mixture to meet the typical section requirements and produce a smooth, finished surface with a uniform appearance and texture. Offset longitudinal joints of successive courses of hot mix by at least 6 in. Place mixture so longitudinal joints on the surface course coincide with lane lines, or as directed. Ensure that all finished surfaces will drain properly. Place mixture within the compacted lift thickness shown in Table 8, unless otherwise shown on the plans or allowed.

Table 8 Compacted Lift Thickness and Required Core Height

Mixture Type	Compacted Lift Thickness	
	Minimum (in.)	Maximum (in.)
A	3.00	6.00
B	2.50	5.00
C	2.00	4.00
D	1.50	3.00

F	1.25	2.50

1. **Weather Conditions.** Place mixture when the roadway surface temperature is 60°F or higher unless otherwise approved. Measure the roadway surface temperature with a handheld infrared thermometer. Unless otherwise shown on the plans, place mixtures only when weather conditions and moisture conditions of the roadway surface are suitable in the opinion of the Engineer.
2. **Tack Coat.** Clean the surface before placing the tack coat. Unless otherwise approved, apply tack coat uniformly at the rate directed by the Engineer. The Engineer will set the rate between 0.04 and 0.10 gal. of residual asphalt per square yard of surface area. Apply a thin, uniform tack coat to all contact surfaces of curbs, structures, and all joints. Prevent splattering of tack coat when placed adjacent to curb, gutter, and structures. Roll the tack coat with a pneumatic-tire roller when directed. The Engineer may use Tex-243-F to verify that the tack coat has adequate adhesive properties. The Engineer may suspend paving operations until there is adequate adhesion.

G. Lay-Down Operations.

1. **Minimum Mixture Placement Temperatures.** Use Table 9 for suggested minimum mixture placement temperatures.
2. **Windrow Operations.** When hot mix is placed in windrows, operate windrow pickup equipment so that substantially all the mixture deposited on the roadbed is picked up and loaded into the paver.

Table 9 Suggested Minimum Mixture Placement Temperature

High-Temperature Binder Grade	Minimum Placement Temperature (Before Entering Paver)
PG 64 or lower	260°F
PG 70	270°F
PG 76	280°F
PG 82 or higher	290°F

H. Compaction. Use air void control unless ordinary compaction control is specified on the plans. Avoid displacement of the mixture. If displacement occurs, correct to the satisfaction of the Engineer. Ensure pavement is fully compacted before allowing rollers to stand on the pavement. Unless otherwise directed, use only water or an approved release agent on rollers, tamps, and other compaction equipment. Keep

diesel, gasoline, oil, grease, and other foreign matter off the mixture. Unless otherwise directed, operate vibratory rollers in static mode when not compacting, when changing directions, or when the plan depth of the pavement mat is less than 1-1/2 in.

Use tamps to thoroughly compact the edges of the pavement along curbs, headers, and similar structures and in locations that will not allow thorough compaction with the rollers. The Engineer may require rolling with a trench roller on widened areas, in trenches, and in other limited areas.

Allow the compacted pavement to cool to 160°F or lower before opening to traffic unless otherwise directed. When directed, sprinkle the finished mat with water or limewater to expedite opening the roadway to traffic.

1. **Air Void Control.** Compact dense-graded hot-mix asphalt to contain from 5% to 9% in-place air voids. Do not increase the asphalt content of the mixture to reduce pavement air voids.
2. **Ordinary Compaction Control.** Furnish the type, size, and number or rollers required for compaction, as approved. Furnish at least 1 medium pneumatic-tire roller (minimum 12-ton weight). Use the control strip method given in Tex-207-F, Part IV, to establish rolling patterns that achieve maximum compaction.

    a. Rollers. Furnish the type, size, and number or rollers required for compaction, as approved. Use a pneumatic-tire roller to seal the surface, unless otherwise shown on the plans. Use additional rollers as required to remove any roller marks.

    b. Air Void Determination. Unless otherwise shown on the plans, obtain 2 roadway specimens at each location selected by the Engineer for in-place air void determination. The Engineer will measure air voids in accordance with Tex-207-F and Tex-227-F. Before drying to a constant weight, cores may be predried using a Corelok or similar vacuum device to remove excess moisture. The Engineer will use the average air void content of the 2 cores to calculate the in-place air voids at the selected location.

    c. Air Voids Out of Range. If the in-place air void content in the compacted mixture is below 5% or greater than 9%, change the production and placement operations to bring the in-place air void content within requirements. The Engineer may suspend production until the in-place air void content is brought to the required level, and may require a test section as described in Section 340.4.H.1.d, “Test Section.”

d. Test Section. Construct a test section of 1 lane-width and at most 0.2 mi. in length to demonstrate that compaction to between 5% and 9% in-place air voids can be obtained. Continue this procedure until a test section with 5% to 9% in-place air voids can be produced. The Engineer will allow only 2 test sections per day. When a test section producing satisfactory in-place air void content is placed, resume full production.

Follow the selected rolling pattern unless changes that affect compaction occur in the mixture or placement conditions. When such changes occur, establish a new rolling pattern. Compact the pavement to meet the requirements of the plans and specifications.

When rolling with the 3-wheel, tandem or vibratory rollers, start by first rolling the joint with the adjacent pavement and then continue by rolling longitudinally at the sides. Proceed toward the center of the pavement, overlapping on successive trips by at least 1 ft., unless otherwise directed. Make alternate trips of the roller slightly different in length. On super elevated curves, begin rolling at the low side and progress toward the high side unless otherwise directed.

I. Irregularities. Immediately take corrective action if surface irregularities, including but not limited to segregation, rutting, raveling, flushing, fat spots, mat slippage, color, texture, roller marks, tears, gouges, streaks, or uncoated aggregate particles, are detected. The Engineer may suspend production or placement operations until the problem is corrected. At the expense of the Contractor and to the satisfaction of the Engineer, remove and replace any mixture that does not bond to the existing pavement or that has other surface irregularities identified above.

J. Ride Quality. Use Surface Test Type A to evaluate ride quality in accordance with Item 585, "Ride Quality for Pavement Surfaces," unless otherwise shown on the plans.

02612.5. MEASUREMENT AND PAYMENT

A. When listed as a separate contract pay item, shall be measured in accordance with "Measurement and Basis of Payment" section or as shown on the Bid Proposal Form.

B. When not listed as a separate contract pay item, shall be considered

as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 321313 – CONCRETE PAVING

(Referenced from 2004 TxDOT, ITEM 531 Sidewalks – references made to any other Sections of the 2004 TxDOT Manual shall become part of the Contract to be followed)

00531.1. DESCRIPTION.

Construct hydraulic cement concrete sidewalks.

00531.2. MATERIALS.

Furnish materials conforming to the following:

- Item 360, "Concrete Pavement"
- Item 420, "Concrete Structures"
- Item 421, "Hydraulic Cement Concrete"
- Item 440, "Reinforcing Steel."

Use Class A concrete or other concrete as specified. Use Grade 8 course aggregate for extruded Class A concrete. Use other grades if approved by the Engineer.

00531.3. CONSTRUCTION.

Shape and compact subgrade, foundation, or pavement surface to the line, grade, and cross-section shown on the plans. Lightly sprinkle subgrade or foundation material immediately before concrete placement. Hand-tamp and sprinkle foundation when placement is directly on subgrade or foundation materials. Remove and dispose of existing concrete in accordance with Item 104, "Removing Concrete." Provide a clean surface for concrete placement directly on the surface material or pavement. Mix and place concrete in accordance with the pertinent Items. Hand-finishing is allowed for any method of construction. Finish exposed surfaces to a uniform transverse broom finish surface. Curb ramps must include a detectable warning surface and conform to details shown on the plans.

Install joints as shown on the plans. Brush all exposed surfaces to a smooth and uniform surface. Ensure that abrupt changes in sidewalk elevation do not exceed 1/4 inch, sidewalk cross slope does not exceed 2%, curb ramp grade does not exceed 8.3%, and flares adjacent to the ramp do not exceed 10% slope. Where a sidewalk crosses a concrete driveway, ensure that the sidewalk

depth and reinforcement are not less than the driveway cross-sectional details shown on the plans.

Provide finished work with a well-compacted mass, a surface free from voids and honeycomb, and the required true-to-line shape and grade. Cure for at least 72 hr. in accordance with Item 420, "Concrete Structures."

A. Conventionally Formed Concrete. Provide sidewalk sections separated by premold or board joint of the thickness shown on the plans in lengths greater than 8 ft. but less than 40 ft., unless otherwise directed. Terminate workday production at an expansion joint.

B. Extruded or Slipformed Concrete. Provide any additional surface finishing immediately after extrusion or slip forming as required on the plans. Construct joints at locations as shown on the plans or as directed.

00531.4. MEASUREMENT AND PAYMENT

A. When listed as a separate contract pay item, shall be measured in accordance with "Measurement and Basis of Payment" section or as shown on the Bid Proposal Form.

B. When not listed as a separate contract pay item, shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 321540 – CRUSHED STONE WALKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Furnish and install crushed stone walks on a prepared sub-base as indicated.

B. Related Sections: Earthwork 31 10 00.

1.2 SUBMITTALS

A. Samples: Samples of crushed stone, one pound in plastic bag contain, stone gradation and full range of color variation.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver and store crushed stone to prevent contamination by other materials or desegregation of aggregate.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Decomposed Granite: Clean, hard, durable particles or fragments of stone with a filler of finely divided material; with the following characteristics:
   1. Reddish brown color.
   2. ¼" minus (screened fines)
   3. Free from clay lumps, vegetable matter, and other foreign materials.

B. Edging:
   1. Concrete Edging: Extruded, fiber mesh and steel reinforced concrete edging (per plans/details) Curb Appeal, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine substrate and conditions under which crushed stone walks work is to be performed. Have the installer notify the Contractor in writing, with a copy to the Owner, if conditions are unsatisfactory. Do not begin he work until unsatisfactory conditions have been corrected in a manner acceptable to the installer. Beginning of work indicates acceptance of project site as satisfactory by the installer.

3.2 PREPARATION

A. Sub-Base: Grade sub-base to line and grade indicated on grading plans to achieve a smooth surface at a consistent dimension below finish grade equal to the depth of crushed stone walk indicated. Compact sub-base to maximum dry density.

3.3 INSTALLATION

A. Place crushed stone in maximum lifts of two inches. Wet entire depth of stone and roll to obtain a dense, smooth, uniform surface, compacted to 95% maximum dry density. Continue placing lifts until total depth indicated is achieved. Match adjacent finish grade of adjacent paving, edging, or ground surface. Provide crowned surface to drain without any puddling on finished surface.

3.4 CLEANING

A. Remove foreign materials from crushed stone walks, and rake surface to provide a smooth finish.

END OF SECTION

SECTION 321613 – CONCRETE CURB, GUTTER, AND COMBINED CURB AND GUTTER

(Referenced from 2004 TxDOT, ITEM 529 Concrete Curb, Gutter, and Combined Curb and Gutter – references made to any other Sections of the 2004 TxDOT Manual shall become part of the Contract to be followed)

00529.1. DESCRIPTION. Construct hydraulic cement concrete curb, gutter, and combined curb and gutter.

00529.2. MATERIALS. Furnish materials conforming to:

- Item 360, "Concrete Pavement"
- Item 420, "Concrete Structures"
- Item 421, "Hydraulic Cement Concrete"
- Item 440, "Reinforcing Steel."

Use Class A concrete or material specified in the plans. Use Grade 8 coarse aggregate for extruded Class A concrete. Use other grades if approved by the Engineer.

529.3. CONSTRUCTION. Provide finished work with a well-compacted mass and a surface free from voids and honeycomb, in the required shape, line, and grade. Round exposed edges with an edging tool of the radius shown on the plans. Mix, place, and cure concrete in accordance with Item 420, "Concrete Structures." Construct joints at locations shown on the plans. Cure for at least 72 hr. Furnish and place reinforcing steel in accordance with Item 440, "Reinforcing Steel." Set and maintain a guideline that conforms to alignment data shown on the plans, with an outline that conforms to the details shown on the plans.

A. Conventionally Formed Concrete. Shape and compact subgrade, foundation, or pavement surface to the line, grade, and cross section shown on the plans. Lightly sprinkle subgrade or foundation material immediately before concrete placement. Pour concrete into forms, and strike off with a template 1/4 to 3/8 in. less than the dimensions of the finished curb unless otherwise approved. After initial set, plaster surface with mortar consisting of 1 part hydraulic cement and 2 parts fine aggregate. Brush exposed surfaces to a uniform texture.

Place curbs, gutters, and combined curb and gutters in 50-ft. maximum sections unless otherwise approved.

B. **Extruded or Slipformed Concrete**. Hand-tamp and sprinkle subgrade or foundation material before concrete placement. Provide clean surfaces for concrete placement. If required, coat cleaned surfaces with approved adhesive or coating at the rate of application shown on the plans or as directed. Place concrete with approved self-propelled equipment. The forming tube of the extrusion machine or the form of the slipform machine must be easily adjustable vertically during the forward motion of the machine to provide variable heights necessary to conform to the established gradeline.

Attach a pointer or gauge to the machine so that a continual comparison can be made between the extruded or slipform work and the grade guideline. Other methods may be used when approved.

Finish surfaces immediately after extrusion or slipforming.

00529.4. MEASUREMENT AND PAYMENT

A. When listed as a separate contract pay item, shall be measured in accordance with "Measurement and Basis of Payment" section or as shown on the Bid Proposal Form.

B. When not listed as a separate contract pay item, shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 32 17 23.13 – PAINTED PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Painted Pavement Marking.
B. Painted curbs, guard posts and light pole bases.

1.2 RELATED SECTIONS

A. Section 31 10 00 – Site Clearing
B. Construction Drawings

1.3 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs and warning light as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The paint shall be a non-bleeding, quick-drying, alkyd petroleum base paint suitable for traffic-bearing surface and shall meet FS TTP-85E and mixed in accordance with manufacturer's instructions before application.

PART 3 - EXECUTION

3.1 PREPARATION

A. Sweep and clean surface to eliminate loose material and dust.

B. Where existing pavement markings are indicated on the drawings to be removed or would interfere with the adhesion of new paint, a motorized abrasive device shall be used to remove the markings. The equipment employed shall not damage the existing paving or create a surface hazardous to vehicle or pedestrian traffic. In all areas within

public rights-of-way, the method of marking removal shall be approved by governing authority.

3.2 APPLICATION

A. Apply two (2) coats of paint at manufacturer recommended rate without the addition of thinner, with a maximum of 100 square feet per gallon. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use a straightedge to ensure a uniform, clean and straight stripe.

B. The following items shall be painted with colors noted below:
   1. Pedestrian Crosswalks: Yellow
   2. Exterior Sidewalk Curbs, Light Pole Bases and Guard posts: Yellow
   3. Fire Lanes: Red or per local code
   4. Lane striping where separating traffic in opposite directions: Yellow
   5. Lane striping where separating traffic in the same direction: White
   6. Handicap Symbols: Per local code
   7. Parking Stall Striping: Yellow, unless otherwise noted on plans

END OF SECTION

SECTION 321723.23 – RAISED PAVEMENT MARKINGS

(Referenced from 2004 TxDOT, ITEM 666 Reflectorized Pavement Markings – references made to any other Sections of the 2004 TxDOT Manual shall become part of the Contract to be followed)

10007.1. Description. Furnish and place reflectorized pavement markings.

10007.2. Materials.

A. Type I Marking Materials. Furnish in accordance with DMS-8220, "Hot Applied Thermoplastic."

B. Type II Marking Materials. Furnish in accordance with DMS-8200, "Traffic Paint."

C. Glass Traffic Beads. Furnish drop-on glass beads conforming to DMS-8290, "Glass Traffic Beads."

1. **Type I Markings.** Furnish Type III drop-on glass beads. Furnish Type II or double-drop of Type II and Type III drop-on glass beads where each type bead is applied separately in equal portions (by weight), only when specified in the plans. When furnishing a double-drop system, apply the Type III beads before applying the Type II beads.
2. **Type II Markings.** Furnish Type III drop-on glass beads or other beads specified on the plans.

D. Labeling. Use clearly marked containers that indicate color, mass, material type, manufacturer, and batch number.

10007.3. Equipment.

A. General Requirements. Use equipment that:

- is maintained in satisfactory condition,
- meets or exceeds the requirements of the National Board of Fire Underwriters and the RRC for this application,
- uses an automatic bead dispenser attached to the pavement marking equipment, and
- can provide continuous mixing and agitation of the pavement marking material. Provide a hand-held thermometer capable of measuring the temperature of the marking material when applying Type I material.

B. Material Placement Requirements. Use equipment that can place:

- at least 40,000 ft. of 4-in. solid or broken markings per day at the specified thickness;

- linear markings up to 8 in. wide in a single pass;
- markings other than solid or broken lines;
- a center-line and no-passing barrier-line configuration consisting of 1 broken line with 2 solid lines at the same time to the alignment, spacing, and thickness shown on the plans, for 3-line application;
- white line from both sides;
- lines with clean edges, uniform cross section and thickness, and reasonably square ends;
- skip lines between 10 and 10-1/2 ft., an approximate stripe-to-gap ratio of 1 to 3, and a stripe-gap cycle between 39-1/2 ft. and 40-1/2 ft., automatically;
- beads uniformly and almost instantly on the marking as the marking is being applied;
- beads uniformly during the application of all lines (each line must have an equivalent bead yield rate and embedment); and;
- double-drop bead applications using both Type II and Type III beads from separate independent bead applicators, if double-drop bead application is used.

10007.4. Construction. Place markings before opening to traffic unless short-term or work zone markings are allowed.

A. General. Obtain approval for the sequence of work and estimated daily production. On roadways already open to traffic, place markings with minimal interference to the operations of that roadway. Use traffic control as shown on the plans or as approved. Protect all markings placed under open-traffic conditions from traffic damage and disfigurement. Establish guides to mark the lateral location of pavement markings as shown on the plans or as directed, and have guide locations verified. Use material for guides that will not leave a permanent mark on the roadway.

Apply markings on pavement that is completely dry and passes the following tests:

- Type I Marking Application—Place a sample of Type I marking material on a piece of tarpaper placed on the pavement. Allow the material to cool to ambient temperature, and then inspect the underside of the tarpaper in contact with the pavement. Pavement will be considered dry if there is no condensation on the tarpaper.
- Type II Marking Application—Place a 1-sq. ft. piece of clear

plastic on the pavement, and weight down the edges. The pavement is considered dry if, when inspected after 15 min., no condensation has occurred on the underside of the plastic.

Apply markings:

- that meet the requirements of Tex-828-B,
- using widths and colors shown on the plans,
- at locations shown on the plans,
- in proper alignment with the guides without deviating from the alignment more than 1 in. per 200 ft. of roadway or more than 2 in. maximum,
- without abrupt deviations,
- free of blisters and with no more than 5% by area of holes or voids,
- with uniform cross section and thickness,
- with clean and reasonably square ends,
- that are reflectorized, and
- using personnel skilled and experienced with installation of pavement markings. Remove all applied markings that are not in alignment or sequence as stated in the plans or as stated in the specifications at the Contractor's expense in accordance with Item 677, "Eliminating Existing Pavement Markings and Markers," except for measurement and payment.

B. Surface Preparation. Unless otherwise shown on the plans, prepare surfaces in accordance with this section.

1. **Cleaning for New Asphalt Surfaces and Retracing of All Surfaces.** For new asphalt surfaces (less than 3 years old) and retracing of all surfaces, air-blast or broom the pavement surface to remove loose material, unless otherwise shown on the plans. A sealer for Type I markings is not required unless otherwise shown on the plans.
2. **Cleaning for Old Asphalt and Concrete Surfaces (Excludes Retracing).** For old asphalt surfaces (more than 3 years old) and all concrete surfaces, clean in accordance with Item 678, "Pavement Surface Preparation for Markings," to remove curing membrane, dirt, grease, loose and flaking existing construction markings, and other forms of contamination.
3. **Sealer for Type I Markings.** For asphalt surfaces more than 3 years old or for concrete, apply a pavement sealer before placing Type I markings on locations that do not have existing markings, unless otherwise approved. The pavement sealer may be either a Type II

marking or an acrylic or epoxy sealer unless otherwise shown on the plans. Follow the manufacturer's directions for application of acrylic or epoxy sealers. When the sealer becomes dirty after placement, clean by washing or in accordance with Section 666.4.B.1, "Cleaning for New Asphalt Surfaces and Retracing of All Surfaces," as directed. Place the sealer in the same configuration and color (unless clear) as the Type I markings unless otherwise shown on the plans.

C. Application. Apply markings during good weather unless otherwise directed. If markings are placed at Contractor option when inclement weather is impending and the markings are damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the markings if required.

1. **Type I Markings.** Place the Type I marking after the sealer cures. Apply within the temperature limits recommended by the material manufacturer. If during a spray application, operations cease for 5 min. or longer, flush the spray head by spraying marking material into a pan or similar container until the material being applied is at the recommended temperature.

2. Apply on clean, dry pavements passing the moisture test described in Section 666.4.A, "General," and with a surface temperature above 50ºF when measured in accordance with Tex-829-B.

Apply Type I markings with a minimum thickness of:

- 0.100 in. (100 mils) for new markings and retracing water-based markings on surface treatments involving Item 316, "Surface Treatments," or Item 318, "Hot Asphalt-Rubber Surface Treatments,"
- 0.060 in. (60 mils) for retracing on thermoplastic pavement markings, or
- 0.090 in. (90 mils) for all other Type I markings. The maximum thickness for Type I markings is 0.180 in. (180 mils). Measure thickness for markings in accordance with Tex-854-B using the tape method.

1. **Type II Markings.** Apply on surfaces with a minimum surface temperature of 50°F. Apply at least 20 gal. per mile on concrete and asphalt surfaces and at least 22 gal. per mile on surface treatments for a solid 4-in. line. Adjust application rates proportionally for other widths. When Type II markings are used as a sealer for Type I markings, apply at least 15 gal. per mile using Type

II drop-on beads.

2. **Bead Coverage.** For Type I and Type II markings, provide a uniform distribution of beads across the surface of the stripe, with 40 to 60% bead embedment.

D. Performance Period. All markings and replacement markings must meet the requirements of Tex-828-B for at least 30 calendar days after installation. Unless otherwise directed, remove pavement markings that fail to meet requirements, and replace at the Contractor's expense. Replace failing markings within 30 days of notification.

10007.5. Measurement. This Item will be measured by the foot; by each word, symbol, or shape; or by any other unit shown on the plans. Each stripe will be measured separately.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal unless modified by Article 9.2, "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

Acrylic or epoxy sealer, or Type II markings when used as a sealer for Type I markings, will be measured by the foot; by each word, symbol, or shape; or by any other unit shown on the plans.

10007.6. MEASUREMENT AND PAYMENT

A. When listed as a separate contract pay item, shall be measured in accordance with "Measurement and Basis of Payment" section or as shown on the Bid Proposal Form.

B. When not listed as a separate contract pay item, shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 323113 – FENCES, GATES, AND DUGOUT

PART 1 GENERAL

1.01 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.02 WORK INCLUDED

A. Provide all labor, equipment, and materials for the construction of galvanized chain link fencing and gates at the locations shown on the drawings.

B. Provide all labor, equipment, and materials for the construction of the galvanized chain link fencing dugout enclosures at the locations shown on the drawings.

1.03 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Temporary construction fencing

B. Concrete

1.04 SUBMITTALS

A. PRODUCT DATA: Submit manufacturer's literature indicating the performance, fabrication procedures, product variations and

accessories.

B. SUBMITTALS: Submit shop drawings including details illustrating fence height, size of posts, rails, braces, gates, and footings, accessories and erection procedures.

C. Reference Section 01340 SUBMITTALS for additional submittal requirements.

1.05 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

1.06 QUALITY ASSURANCE

A. GENERAL: Provide fences and gates as complete units produces by a single manufacturer, including necessary erection accessories, fittings and fastenings.

B. EXAMINATION OF CONDITIONS: Installer shall examine the conditions under which the fences and gates are to be installed. Notify the Owner in writing of all conditions detrimental to the proper and timely completion of the work.

C. QUALIFICATIONS FOR INSTALLER: Erection of the work of this section shall be done by qualified, experienced personnel under direct supervision of fencing manufacturer's field representative.

D. PRODUCT DELIVERY, STORAGE AND HANDLING: Deliver material in manufacturer's original packaging with all tags and labels intact and legible. Handle and store material in such a manner as to avoid damage.

E. PRODUCT REPLACEMENTS: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. GENERAL:

1. All materials, fabric fittings, appurtenances, hardware, fasteners, and fabrications (other than aluminum of stainless steel ties) to be hot-dipped galvanized after fabrication; posts and rails may be field cut only when the cut ends will be covered completely and protected by concrete or fittings.
2. Zinc for galvanizing shall conform to the requirements ASTM B6. Galvanizing of materials shall conform to the following requirements:
   (a) Pipe: ASTM A-120 (1.8 oz zinc psf)
   (b) Hardware and Accessories: ASTM A-153 (2 oz zinc psf)
   (c) Chain link fabric: ASTM A-392, Class II (not less than 1.2 oz zinc psf)

B. CHAIN LINK FABRIC: One piece of fabric widths, No. 9 gauge wires, 2" mesh typical, 1-¾" mesh at tennis courts. Copper bearing steel wire, tensile strength 80,000 psi. Hot dipped galvanized after weaving. Top and bottom selvages shall be knuckled for all chain link fabric.

C. POSTS, RAILS AND BRACES:

1. End, Corner and Pull Posts: 2-½" I.D. standard weight, Schedule 40 round galvanized steel pipe; weight 5.79 lbs./linear foot. Install one pull post at the center of FENCE line and one terminal post at each end and/or change of direction.
2. Line Posts: Typical line posts up to 6' high shall be 2" I.D. Standard weight, schedule 40 round galvanized steel pipe, weight 3.65 lbs./linear foot, spaced on 10' centers, maximum. Fabric shall be attached to posts with 9 gauge zinc coated wire ties 12" o.c. maximum. For posts up to 12' high, use 2-½" I.D. x 9.11 lbs./linear foot.
3. Top Rail: 1-¼" I.D. Schedule 40 galvanized steel pipe, weight 2.27 lbs./linear foot furnished in manufacturer's standard lengths of approximately 21'-0" with couplings approximately 6" long for each joint, one coupling in each 5 to have expansion spring. Provide means for attaching top rail to each gate, corner, pull and end posts. Top rail shall form continuous brace from end to end of each run of fence.
4. Post Brace Assembly: Provide bracing assemblies at terminal and gate posts and at both sides of corner and pull posts, with the horizontal brace located at mid-height of the fabric. Use 1-¼" I.D. Schedule 40 galvanized pipe for horizontal brace and ⅜" diameter rod with turnbuckle for diagonal truss.
5. Tension Wire: 7 gauge galvanized steel spring wire at bottom of

fence.

6. Post Tops: Pressed steel, or malleable iron designed as a weathertight closure top for tubular posts. Provide one cap for each post. Provide tops to permit through passage of top rail.
7. Stretcher Bars: One piece lengths steel equal to full height of fabric with minimum cross-section of 3/16" x ¾. Provide one stretcher bar for each gate and end post and 2 for each corner or pull post.
8. Stretcher Bar Bands: Heavy pressed steel or malleable iron, spaced not over 15" o.c. to secure stretcher bars to end, corner and gate posts.
9. Wire Ties: For tying fabric line posts, use minimum 9 gauge aluminum or galvanized steel wire ties for tubular posts spaced 14" o.c. For tying fabric to rails and braces, use 9 gauge aluminum wire ties spaced 24" o.c. For tying fabric to tension wire, use 11 gauge hog rings spaced 24" o.c.
10. Concrete: Conform to requirements of ASTM C-92, 1" maximum size aggregate and at least 4 sacks cement per cubic yard, 3% to 6% entrained air, 3,000 psi at 28 days, maximum 3" slump.

D. SWINGING GATES:

1. Fabricate gate perimeter frames of 1-1/2" I.D. Schedule 40 galvanized pipe; weight 2.72 pounds per linear foot. Provide additional horizontal and vertical members to ensure proper gate operation and for attachment of fabric, hardware and accessories. Assemble gate frames by welding or fittings and rivets for rigid connections. Use same fabric as for fence. Install fabric with stretches bars at vertical edges and tie wires at top and bottom edges. Attach stretcher bars to gate frame at not more than 15" o.c. Attach hardware with rivets. Provide diagonal cross-bracing of gate frames by means of ⅜" diameter adjustable length truss rods.
2. Gate Posts:
   (a) Single leaf 6 ft. or double leaf 12 ft.: 3 inch o.d. 7.58 pounds per foot, ASTM A120, galvanized schedule 50 pipe or 3 inch x 3 inch roll section, ASTM A501, hot dipped galvanized.
   (b) Single leaf 10 ft. or double leaf 20 ft.: 4 inch o.d. pipe 9.11 pounds per foot, ASTM A120, galvanized schedule 50 or 3" x 3" roll section ASTM A501.
   (c) Single leaf 16 ft. or double leaf 32 ft.: 6-⅝ inch o.d. pipe 1 8.97 pounds per foot, galvanized schedule 50 pipe.

E. GATE HARDWARE:

1. Pressed steel or malleable iron hinges to suit gate size, non-lift off type, offset to permit 180 degree gate opening. Provide 1 pair of

hinges for each leaf.

2. Latch: Forked type or plunger-type to permit operation from either side of gates. Provide padlock eye as integral part of latch.
3. Keeper: Provide keeper which automatically engages gate leaf and holds in open position until manually released.

F. DUGOUT:

1. Dugout slab, shelter configuration, and chain link enclosure size and height on front, sides, and rear shall be as indicated on drawings.
2. Installation of Dugout posts, shelter structure, and fence posts in front of Dugout shall be coordinated by contractor.

PART 3 EXECUTION

3.01 INSTALLATION

A. GENERAL: Obtain approval from Engineer for fencing layout, gate locations, direction of gate swings, and corner and end post locations prior to beginning work.

B. INSTALLING POSTS: All posts shall be spaced not more than 10' apart. Drill holes for post footings in firm undisturbed or compacted soil. The holes shall have a diameter equal to 3 times the diameter of the post (9" minimum). Excavate hole depths approximately 3" lower than post bottom for concrete coverage of post bottom. Set the posts and place concrete around posts in a continuous pour, tamp for consolidation. Check each post for vertical and top alignment and hold in position during placement and finishing operation. Set top of concrete footing 2" above proposed finish grade and finish trowel top of footings with slope or dome to direct water away from posts. Set keepers, stops, sleeves and other accessories into concrete as required.

C. FOOTING DEPTHS:

1. Typical 4' to 6' high fencing
   (a) Terminal and line posts: Minimum 36" deep
   (b) Corner and pull posts: Minimum 48" deep
2. Gates
   (a) 36" to 48" wide leaf: Minimum 48" deep
   (b) 54" to 72" wide leaf: Minimum 60" deep
   (c) 78" to 96" wide leaf: Minimum 72" deep
   (d) Tie each pair of gate posts together with 12"x12" reinforced concrete beam poured with footings. Provide minimum 6" earth coverage over tie beam.

D. CONCRETE STRENGTH: Allow concrete to attain at least 75% of its minimum 28 day compressive strength, but in no case sooner than 7 days after placement, before rails, tension wires, barbed wire, or fabric is installed. Do not stretch and tension fabric and wires, and do not hang gates until the concrete has attained its full design strength, minimum design strength for concrete of 3,000 pounds per square inch at 28 days.

E. INSTALLING TOP AND MID RAILS: To start the installation, a length of top rail shall be run through the first couple of post tops; a rail clamp shall be assembled on the end, corner or gate posts, as the case may be. The end of the rail already placed shall be butted into the clamp and fastened. The top rail shall be installed along the run of the fence and the various sections joined with sleeve couplings. At no more than every 100' an expansion coupling shall be placed to allow for expansion and contractions of the rail. The rail shall be clamped in the end, corner or gate posts at the end of the run of the installation of the top rail.

F. BRACE ASSEMBLIES: Install braces so posts are plumb when diagonal rod is under proper tension. Provide one brace assembly for each gate and end post and two for each corner and pull posts.

G. TENSION WIRE: Install tension wire before stretching fabric and tie to each post with tie ties or clips.

H. INSTALLING FABRIC: Leave approximately 1" between finish grade and bottom selvage. Pull fabric taut and tie to posts, rails and tension wires. Install fabric on the outside of the fence and anchor to framework so that fabric remains in tension after pulling fence is released. Stretcher bars shall be threaded through the fabric for seaming it to end, corner, pull and gate posts. The stretcher bars shall be secured to the posts with metal bands spaced not over 15" o.c.

I. GATES: Install gates plumb, level and secure for full opening without interference. Install ground-set items in concrete for anchorage as recommended by the fence manufacturer. Adjust hardware for smooth operation and lubricate where necessary.

J. CLEAN UP: The Contractor shall remove from the site all tools, equipment, trash, etc., used for the project. Remove all markings from posts and rails.

END OF SECTION

SECTION 328000 - IRRIGATION

PART 1 -GENERAL

1.01 SYSTEM DESIGN

A. The irrigation system outlined on the Drawings indicates areas to be irrigated, but the sprinkler and drip irrigation systems must be designed by a licensed professional.
B. The Contractor must submit the credentials for said professional for approval prior to proceeding with irrigation systems design and installation.
C. The design plans shall be prepared by the approved professional, signed, stamped, and submitted for approval. Once approved, the irrigation system construction may begin.

1.02 WORK INCLUDED

A. Trenching and other excavation.
B. Irrigation lines, valve control circuits and appurtenances.
C. Irrigation controllers and remote control valves.
D. Electrical service and service installation if required.
E. Testing.
F. Backfill and compaction of backfill.
G. Dust alleviation and control.
H. Cleanup and disposal.
I. Supplying all labor, materials, equipment, and apparatus not specifically mentioned herein or noted on the plans, but which are incidental and necessary to complete the work specified.

1.03 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the general designation only.
B. American Society for Testing and Materials (ASTM) Publications:
C. D -1785, Pipe, Polyvinyl Cholride (PVC) Plastic Schedules 40, 80 and 120.
D. D-1784, Pipe, Polyvinyl Cholride (PVC) Plastic Class 200.

1.04 QUALITY ASSURANCE

A. Irrigation mains, lines and appurtenances shall be subject to successfully passing a leakage test as prescribed herein.
B. Irrigation lines shall be installed after satisfactory completion of roadway or landscape subgrade.

C. Submit catalogue cuts of irrigation valves, controllers, and associated equipment for approval.

1.05 JOB CONDITIONS

A. Contractor shall conduct operations and schedule cleanup in a manner to cause the least possible obstruction and inconvenience to traffic, pedestrians, and any adjacent property owners or tenants.
B. Locations for proposed irrigation controllers and/or electrical service points shown on the plans are approximate only and the exact locations for such shall be as established in the field by the Engineer.
C. Damage resulting from movement of the sides or bottom of trenches or other excavation which is attributable to the Contractor's acts or omissions, whether sides are braced or not, and any portions of the area and work affected by such movement, shall be satisfactorily repaired or restored.
D. Contractor shall supply and deliver the following equipment and information prior to acceptance of the work:
   1. Three (3) each (if applicable) quick coupler valve keys and hose swivel ells.
   2. Two (2) sets of various special wrenches or tools that may be required for adjustment of sprinkler heads or equipment.
   3. Three (3) (if applicable) keys or wheel handles required to operate hose bibs.
   4. Two (2) copies of the instruction manual for each irrigation controller.
E. Comply and conform with conditions and requirements indicated under Section 02202, Trenching and Backfill, of these Specifications.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS FOR IRRIGATION MAINS

A. Pressure mains and non-pressure mains shall be polyvinyl chloride (PVC) Schedule 40 conforming to the requirements of ASTM Designation D1785 or Class 200 (ASTM D1784) and shall be provided with solvent weld joints and fittings.
B. All plastic fittings shall be Schedule 40 polyvinyl chloride (PVC) conforming to the requirements of ASTM Designation D1785 or Class 200 (ASTM D1784) and shall be specifically made for the type of pipe used.
C. All nipples and fittings for risers shall be Schedule 80 polyvinyl-chloride (PVC) conforming to the requirements of ASTM Designation D1785. Nipples, fittings and risers shall be same size as sprinkler head inlets.
D. All polyvinyl chloride (PVC) pipe and fittings shall be free from

imperfections.

E. Metallic nipples and fittings for above-ground installation of backflow preventer systems shall be Schedule 40 or Class 200 brass nipples and class 125# bronze fittings. All brass nipples and bronze fittings shall be factory threaded.

2.02 JOINTS FOR POLYVINYL CHLORIDE (PVC) PIPE

A. Rubber ring seal joints shall be made in accordance with the manufacturer's instructions and as indicated on the plans.
B. Solvent weld joints shall be made using P-70 primer as manufactured by "Weld-On" or approved equal and "Weld-On" 710 joint cement or approved equal.
C. All threaded joints shall be factory formed. Field threading of pipe or fittings will not be permitted. Threaded joint connections shall be made with virgin teflon tape, or approved equal.

2.03 VALVES AND VALVE BOXES

A. Gate valves, where required on the plans, shall be the same size as the main line and shall be as shown on plans or approved equal. Size and type of valve shall be as indicated on the plans.
B. Quick coupling valves shall be as manufactured by "Rainbird", brass or bronze one piece body designed for a working pressure of 125 psi and equipped with metal covers, or approved equal. Contractor shall provide the Engineer with three (3) for each quick coupler keys and double lug hose swivel ells. Type and model of valve shall be as indicated on the plans.
C. Remote control valves shall be as shown on plans, normally closed, diaphragm actuated, electrically operated from remote location by means of 18/24V, 50/60H, 7.5VA coil, with brass bleed plug for manual operation. Substitutions for irrigation controllers and/or remote control valves shall be at the sole option of the Engineer and shall require prior written consent. Remote control valve sizes shall be the same as the supply runs on which they are to be installed.
D. Valve boxes for gate valves and remote control valves in turf, shrub and ground cover areas shall be fiberglass reinforced plastic, color green, as manufactured by "Ametek", "Carson" or approved equal.
E. Gate Valves Box Covers to be factory marked "Irrigation Control Valve" and shall have a valve number permanently stenciled on it with white exterior paint.
F. Remote Control Valve Boxes shall be rectangular with a minimum dimension of 10-1/2" x 17-1/4" at the base. Cover to be factory marked "RCV" and shall have a station number permanently stenciled on it with

white exterior paint.

G. Valves shall be individually housed. Manifolding of valves in a single valve box shall not be permitted.

2.04 SPRINKLER HEADS

A. All bubblers and stationary shrub sprays on risers, pop-up spray heads and gear-driven stream rotors for ground cover, shrubs and turf shall be as manufactured by "Toro" or approved equal. Type and model of such heads shall be as indicated on the plans.

B. All pop-up spray heads and gear-driven stream rotors for ground cover, shrubs and turf shall be as manufactured by “Rainbird” or by "Hunter", or approved equal. Type and model of such heads shall be as indicated on the plans.

2.05 IRRIGATION LINE INSTALLATION

A. Controllers for irrigation systems shall be solid state type controllers as manufactured by either Rainbird or Hunter or as shown. Controller installations shall consist of models to provide the required number of control valve stations to a maximum of twenty-four (24) stations per controller installation:

B. Substitution for irrigation controllers on an "or equal" basis shall be at the sole option of, and shall require the prior written consent from the Engineer.

C. Remote final strength shall be verified by the contractor in presence of the project inspector prior to final installation to determine the need of a high gain antenna assembly.

D. Irrigation controllers shall be mounted as specified in the Detail Drawings.

E. Controllers shall be 120V from a metered power supply, unless solar or battery operated systems are specified.

F. All electrical wires and cables, shall be placed in conduits (1” minimum diameter).

G. Controller enclosures shall be furnished with acceptable keyed locking mechanisms and furnished with keys.

2.06 BACKFLOW PREVENTION DEVICE

A. Backflow prevention devices shall be as required by Section 1003 of the Uniform Plumbing Code, and as approved by the City/County Public Health Department. Model and details of such devices shall be as indicated on the plans.

2.07 CONTROL VALVE CIRCUITS

A. Wire for valve control circuits shall be UL-approved for direct burial in ground, size #14-l. Common ground wire shall have white insulating jacket. Control wire shall have jacket of color other than white and the jacket color for any circuit shall be continuous between controller and valve. A circuit color code schedule shall be posted inside each controller enclosure.
B. Splices shall be made with #2006-S "Buchanon" splice caps and 3M #3576 "Scotchloc" seal packs or approved equal.

2.08 THRUST BLOCKS FOR RUBBER RING SEAL JOINTS

A. Thrust blocks shall be provided where necessary to resist pressure on rubber ring seal joints. Concrete for thrust blocking shall conform to the requirements of Section 02550 of these specifications.

2.09 PIPE COVER MATERIAL

A. Shall be in conformance to Section 02202, Trenching and Backfill, of these Specifications.

PART 3 -EXECUTION

3.01 TRENCHING, BACKFILLING AND COMPACTION

A. Shall be in conformance to Section 02202, Trenching and Backfill, of these Specifications.

3.02 IRRIGATION LINE INSTALLATION

A. Pipe, valves, fittings, and appurtenances shall be installed as accurately as possible in accordance with the locations shown on the plans. All polyvinyl chloride (PVC) pipe shall be installed with identification markings facing upward, visible from the top of the trench. Cap or plug openings as pipeline is assembled to prevent entrance of dirt or obstructions. Remove caps or plugs only when necessary to continue assembly. Where pipes pass through sleeves, provide removable non-decaying plug at ends to prevent entrance of earth. No irrigation lines shall be constructed before subgrade for roadway and median areas have been satisfactorily completed.
B. Depth of cover for pressure mains shall be twenty-four (24) inches below subgrade in areas to be paved and in landscape areas. Depth of cover

for non-pressure lines shall be eighteen (18) inches below sub-grade in areas to be paved, eighteen (18) inches below subgrade for topsoil for mainlines and twelve (12) inches below subgrade for topsoil for lateral lines in landscape areas.

C. Pipe, valves and fittings shall be carefully handled during hauling, unloading, and placing operations, so as to avoid breakage or damage. All polyvinylchloride (PVC) pipe shall be stored carefully, and protected from prolonged sunlight. Broken or damaged pipe or appurtenances will be rejected and shall be replaced.

D. Irrigation lines shall be installed as accurately as possible in accordance with the locations shown on the plans. The plans are diagrammatic only, and where irrigation lines on the plans are shown under paved areas but running parallel and adjacent to planted areas, the intent is to install the irrigation lines in the planted area. Irrigation lines shall have a minimum horizontal clearance of four (4) inches from each other, and a minimum horizontal clearance of twelve (12) inches from other underground lines (this requirement does not apply to any lines crossing at angles from 45 to 90 degrees with each other). A minimum of two (2) inches vertical clearance shall be maintained between lines which cross between these angles. No irrigation line shall be installed parallel to and directly over another line. Intermediate high spot along the irrigation line shall not be allowed.

E. All pipes shall be assembled free from dirt, shall be reamed and all burrs shall be removed. When pipe laying is not in progress, all open pipe ends shall be closed with watertight plugs in a manner satisfactory to the Engineer. Before installation of irrigation lines, the Contractor shall remove all stakes, debris, loose rock and other hard material from the bottom of the trench.

F. After the final positioning, the pipe shall be held in place in the trench with backfill material placed equally on both sides of the pipe at as many locations as are required to hold the pipe section in place. After joints are completed, the backfill material shall be redistributed and compacted as herein required.

G. At the end of each day and when work is not in progress, the open ends of pipe installed in the line shall be closed with watertight plugs, and openings for valves and other appurtenances shall be suitably covered.

H. Concrete thrust blocks of the form and dimensions shown or noted on the plans shall be provided as indicated on the plans. Form thrust blocks in such a manner to prevent any concrete from coming in contact with the pipe. Thrust blocks shall be constructed to completely fill the void between solid soil and the fitting, and shall be installed in strict conformance with the applicable details shown or noted on the plans.

3.03 JOINT AND FITTING INSTALLATION

A. Rubber Ring Seal Joints
   1. Use factory made male ends or prepared field cut male end joints to exact specifications of factory made ends. Join lengths of pipe by means of integrally formed bell end on pipe using rubber ring seal. Carefully clean bell or coupling and insert rubber ring without lubricant. Position ring carefully according to manufacturer's instructions.
   2. Lubricate male end according to manufacturer's instructions and insert male end to specified depth. Use hands only when inserting PVC pipe.
   3. Thrust blocks shall be provided where necessary to resist system pressure on joints or fittings made with rubber ring seal joint pipe in accordance with the details shown on the plans.

B. Solvent Weld Joints Prepare joint by first making sure the pipe end is square, then deburring the pipe end and cleaning pipe of dirt, dust and moisture. Dry-insert pipe into fitting to check for proper sizing. Pipe should enter fitting 1/3 to 2/3 depth of socket. Coat the inside socket surface of the fitting and the external surface of the male end of the pipe with 711 primer manufactured by "Weld-On" or approved equal. Then, without delay, apply "Weld-On" 710 joint cement or approved equal liberally to the inside of the socket. At this time, apply a second coat of cement to the pipe end. Insert pipe immediately into fitting and turn 1/4 turn to distribute cement and remove air bubbles. The pipe must seat to the bottom of the socket and fitting. The fitting shall be properly aligned without strain. Hold joint still for approximately thirty (30) seconds and then wipe the excess cement from the pipe and fitting. Cure joint a minimum of thirty (30) minutes before handling and at least six (6) hours before allowing water in the pipe.

C. Threaded Joints
   1. Field threading of plastic pipe or fittings is not permitted. Only factory formed threads and factory fabricated nipples or risers shall be permitted.
   2. When assembling threaded plastic joints, take up joint no more than one full turn beyond hand tight.
   3. Threaded joint connections shall be made up with virgin teflon tape, or approved equal.

3.04 VALVE AND VALVE BOX INSTALLATION

A. Valve boxes shall be grouped and located in shrub and ground cover areas wherever possible. Valves shall be installed no farther than twelve (12) inches from the main line and no closer than twelve (12) inches

from walk edges, buildings and walls.

B. Thoroughly flush main line before installation. Valves shall be installed as indicated on the details shown on the plans.
C. All control valves shall be three (3) inches minimum and eight (8) inches maximum below finish grade to the top of the flow control stem.
D. Quick coupling valves shall be located as called for on the plans and installed as indicated on the details shown on the plans.
E. Valve boxes shall be set flush with finish grade in lawn areas and one and one-half (1-1/2) inches above grade in shrub areas.

3.05 SPRINKLER HEAD INSTALLATION

A. Lawn heads shall be located with a minimum of one (1) inch, a maximum of two (2) inches, clear from adjacent paving or headers, and flush with them where a potential hazard may occur. Other lawn heads shall be installed as indicated on the details shown on the plans.
B. Pop-up heads of approved design shall be installed at edges of landscaped areas adjoining paved areas as indicated on the details shown on the plans. Interior shrub heads shall be either pop-up heads set level with finish grade or fixed heads set six (6) inches above finish grade.
C. Individual heads shall be adjusted as required to obtain uniform coverage without overthrow onto buildings, paving, main walks, or other structures.
D. Each section of lateral pipe shall be thoroughly flushed out before the sprinkler heads are attached.
E. Sprinkler heads shall be located and installed as shown on the plans.

3.06 IRRIGATION CONTROLLER INSTALLATION

A. Controller enclosures shall be located, and irrigation controllers and enclosures shall be installed, as shown on the plans. The sprinkler controller chart shall be a photostatic reproduction of the sprinkler or irrigation plan, provided and installed by the Contractor. It shall be laminated permanently in plastic and securely attached to the inside lid of the controller cabinet and shall correctly relate each section to its respective system.

3.07 CONTROL WIRE INSTALLATION

A. Connection of control lines to controller shall be in sequential arrangement according to assigned identification number of valve. Connections shall be made by crimping bare wires with brass connectors and sealing with epoxy resin sealer packs. Control lines shall

be labeled at the controller with permanent non-fading labels indicating identification number of valve controlled.

B. All control wiring shall be laid to minimum depth of eighteen (18) inches in common trenches with mainline piping wherever possible. Where control lines do not parallel mains, wires shall be strapped at intervals of at least ten (10) feet to the underside of two by four redwood boards.

C. Where control lines pass under paving, they shall pass through Schedule 40 PVC conduit sleeves. Where control wires pass through sleeves, Contractor shall provide removable non-decaying plug at ends of the sleeve to prevent entrance of earth.

D. Contractor shall loop a minimum of three (3) feet of extra wire in each valve box; both control wire and ground wire. All splices shall be made at a valve box only.

3.08 ELECTRICAL SERVICE INSTALLATION

A. Make all electrical connections to 120 Volt service at each controller location. Install a disconnect switch inside the pedestal of the controller cabinet. All electrical work and materials shall comply with these specifications and any further requirements of the permit issued for the electrical service connection by the serving utility.

3.09 TESTING

A. Hydrostatic and leakage tests shall be made only after the trenches have been backfilled sufficiently to hold the pipe firmly in position with no fittings being backfilled.

B. All welded plastic pipe joints shall have cured for at least 24 hours. Provide all water necessary for filling and flushing at no additional expense to the Contract.

C. Pressure irrigation mains shall be subjected to a hydrostatic test of 125 psi. Each section being tested shall be slowly filled with water, care being taken to expel all air from the pipe by such means as are necessary. The pipes must be flushed before testing to remove any foreign material. The test pressure shall be applied for not less than four (4) hours. Any leakage discovered in consequence of the pressure test shall be corrected and the test shall be repeated until satisfactory results are obtained. Any defective pipe, fittings, valves, or joints shall be repaired or replaced.

D. Contractor shall provide water as necessary for hydrostatic testing.

END OF SECTION

(Referenced from 2004 TxDOT, ITEM 168 Vegetative Watering – references made to any other Sections of the 2004 TxDOT Manual shall become part of the Contract to be followed)

00168.1. Description. Provide and distribute water to promote growth of vegetation as directed.

00168.2. Materials. Use water that is clean and free of industrial wastes and other substances harmful to the growth of vegetation.

00168.3. Construction. Apply water when directed. Furnish and operate equipment to distribute water at a uniform and controllable rate. Ensure that watering does not erode soil or plantings. Apply water in the required quantity where shown on the plans or as directed.

00168.4. MEASUREMENT AND PAYMENT

A. When listed as a separate contract pay item, shall be measured in accordance with "Measurement and Basis of Payment" section or as shown on the Bid Proposal Form.

B. When not listed as a separate contract pay item, shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 328420 – IRRIGATION SYSTEM FOR ATHLETIC FIELDS

PART 1 - GENERAL

1.1 QUALIFICATIONS OF IRRIGATION CONTRACTOR:

A. The irrigation contractor's primary business shall be the complete installation of automatic sprinkler systems for athletic fields.

B. The irrigation contractor must be an approved contractor with a minimum of 5 years' experience installing automatic irrigation systems on athletic fields. The irrigation contractor shall submit a list of at least ten athletic fields they have installed irrigation for within the last eighteen months. The irrigation contractor shall provide digital pictures of each of the ten fields taken after completion of the irrigation systems.

C. The irrigation contractor shall provide a list of at least ten references. The references shall be High School, or College Athletic Directors or Head Coaches, and must include their name, telephone number, and description of the athletic field or fields irrigated by the contractor.

D. The irrigation contractor must have a current Irrigation License issued by the State of Texas.

E. The irrigation contractor shall be thoroughly familiar with the type of material specified for the installation and the manufacturers' recommended methods of installation and shall direct the work performed under this section.

1.2 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including and Supplementary Conditions and Division 1 Specification sections, apply to the work of this Section.

1.3 WORK SUMMARY:

A. Furnish all labor, materials, equipment, instruction manuals necessary to install a complete operational automatic irrigation system in strict accordance with specifications and drawings including but not limited to the following:

1. Furnishing and installation of complete automatic irrigation systems to irrigate the athletic fields as illustrated in the construction drawings.
2. Trenching, backfill-and compaction work.
3. Furnishing and installation of a water meter and backflow prevention devices per local code.
4. Installation of sleeves for irrigation piping and remote control wires where shown on drawings.
5. Low voltage wiring as required operating the automatic irrigation controllers including extra wires as specified on drawings.
6. Inspection and tests.
7. Preparation and recording of "as-built" irrigation plans for project Owner's use.
8. Warranty and Guarantees.
9. Maintenance procedures and follow-up adjustments to entire system.

1.4 QUALITY ASSURANCE AND REQUIREMENTS OF REGULATORY AGENCIES:

A. All work and materials shall be in full accordance with latest rules and regulations of safety orders of Division of Industrial Safety, The Uniform Plumbing Code, State Law, and other applicable laws or regulations, including the City of Edinburg Plumbing Codes.

B. Procure all required permits and pay all required fees for water meter taps and backflow devices. Arrange for inspections required by all local agencies and ordinances during the course of work.

C. Nothing in these drawings and specifications shall be construed to permit work not conforming to the governing codes and applicable rules and regulations. Should the contractor documents be at variance with the aforementioned rules and regulations, notify the Landscape Architect and get instructions prior to start of any irrigation related works.

D. Furnish and maintain all necessary warning signs, shoring, red lanterns, barricades, etc. as required by the Safety Orders of the Division of Industrial Safety and Local ordinances.

1.5 SUBMITTALS

A. Submit shop drawings, product data, and installation instructions.

B. Submit a complete materials list of all items proposed to be furnished and installed under this Section.

C. Submit samples of gate valves, pipe, fittings, sprinkler heads, electric irrigation valves, valve boxes, swing joints, and low voltage wire connections.

1.6 RECORD DRAWINGS

A. The contractor shall maintain one record set of blue line prints of the irrigation system in good condition at the site and mark on them the exact "Record". The contractor shall make a daily record of all work installed during each day. Plans shall indicate the exact location of check valves, gate valves, wire locations, head layout, automatic valves, quick couplers, all irrigation piping and wire splices. Locations should be shown by triangular systems of measurements from easily identified, permanent features, such as buildings, curbs, fences, walks, etc. Drawings shall show approved substitutions, if any, of the materials including manufacturers' name and catalog number. Upon completion, all information shall be noted on a clean, legible drawing (to scale) and shall be furnished to the engineers, architect, and owner as "as-built" drawings.

PART 2- PRODUCTS:

2.1 ACCEPTABLE MANUFACTURERS:

A. Products specified are manufactured by Telsco, Excalibur, Sloane, Scotchlock, Carson Industries, King, Rain Bird, Hunter, Lasco, Paigespec, Spears, Matco-Norca, Inc., Cantex, IPS Corporation, Febco, and are listed as a standard of quality.

B. Products of Dixie, Placentia, California, Lasco and Spears conforming to specification requirements are acceptable.

2.2 GENERAL

A. Materials for the irrigation system shall be as indicated on the drawings. All materials shall be new and in perfect working condition.

2.3 PIPE

A. All pipe shall be continuously and permanently marked with

the following information: manufacturer's name or trademark, size, schedule and type of pipe, working pressure at 73 degrees F, and National Sanitation Foundation (NSF). All irrigation pipes shall be installed with the labels oriented on the top surface so that the information can be easily read as viewed from ground level.

B. Piping on pressure side of control valves:
   1. Two inch diameter and smaller and all mains in sleeving shall be Polyvinyl Chloride (PVC) I 120-1220, Schedule 40, and shall conform to ASTM No. 1785-73.
   2. Two and one half inch and larger pipes shall be Polyvinyl Chloride (PVC) 1120-1220 SDR 21.0, Class 200 with rubber gaskets, conforming to ASTM D-1784 and ASTM D-2241. Rubber gasket shall conform to ASTM D-1869 and as provided by pipe manufacturer.
   3. Main lines and lateral lines shall be virgin high impact Polyvinyl Chloride (PVC) pipe and shall have a minimum 200 PSI working pressure rating, NSF approved, and conforming to Commercial Standard 256-63, manufactured by Telsco.

C. Piping on non-pressure side of irrigation control valves.
   1. Polyvinyl Chloride (PVC) 1120-1220, SDR 21.0, Class 200 and conforming to ASTM D-2241-73.
   2. One half-inch pipe shall not be used.
   3. Flexible PVC pipe shall not be used.

2.4 PIPE FITTINGS

A. Fittings for solvent-welded pipe shall be schedule 40, Polyvinyl Chloride, standard weight, as manufactured by "Sloane", Lasco", or approved equal, to meet ASTM D-2466-73 and D-2467-73. Threaded PVC nipples shall be made of Schedule 80.

B. Fittings for swing joints shall be Schedule 80 Polyvinyl Chloride (PVC) with O-rings as manufactured by Lasco or approved equal. Absolutely no flex pipe or polyethylene-type swing joints will be accepted.

C. Solvent cement shall conform to ASTM 1564. Solvent glue shall be IPS Weld-on 700 with a compatible primer, purple in color, or approved equal.

2.5 SLEEVES FOR CONTROL WIRE AND WATER LINE:

A. All conduits and sleeves for irrigation main and laterals shall be 4”

schedule 40 PVC. Sleeves larger than 4" shall be Class 200 PVC. Use 2" Schedule 40 PVC for control wires where it passes under paved surfaces.

2.6 24 VOLT CONTROL WIRES:

A. Wires shall be solid copper, insulated, U>L approved for direct burial in ground. Minimum gauge shall be #14 UF. Common ground wire shall be white.

B. Splicing materials: Schotchlock No. 3576 Sealing Pack, King Wire Connectors, or 3M DBY or DBR connectors.

2.7 VALVE BOXES

A. Valve boxes shall be as manufactured by Carson industries or Ametek, 10" round for gate valves, quick couplers, and remote controlled valves.

B. Valve boxes shall have a black lid. Using stencils and white paint the letters "GV" shall be painted (2" tall) on the lids for gate valves, "QC" for quick couplers, and "RC" for remote controlled valves.

C. Valve boxes for gate valves on the main line shall be supported by a vertical length of 8" PVC pipe such that the valve box is flush with finished grade and the 8" pipe eliminates intrusion of dirt over the valve. Contractor shall provide not less than two valve tools with T-handles of sufficient length to allow operation of the gate valves. Gate valves must be centered inside the 8" vertical pipe to allow easy operation.

2.8 GATE VALVE (SHUT-OFF VALVE)

A. 3" valves and smaller - use 125 pound bronze construction, non-rising stem-type, sized to match the main line size.

B. 4" and larger-

2.9 ELECTRIC VALVES

A. Electric valves shall be Normally Closed, 24 VAC, Rain Bird PEB Series valves.

2.10 BACKFLOW PREVENTION DEVICE

A Shall be as specified on irrigation drawings. Refer to Irrigation Legend for Backflow Prevention Device. The Backflow Prevention Device shall be as manufactured by Febco or approved equal.

2.11 WATER METERS

A Shall be provided and installed by the local water district in accordance with their requirements. The cost of materials and installation shall be included under this Section of Work. Refer to the drawings for the meter size and location.

2.12 IRRIGATION CONTROLLER

A. The irrigation controller(s) shall be a Rainbird ESP-LX Modular Controller or approved equivalent. Refer to the irrigation layout for the location(s) of the controller(s). Irrigation Contractor is responsible for coordination of work necessary to get electrical power to the irrigation controller(s).

2.13 QUICK COUPLING VALVE

A. Shall be 1" as manufactured by Buckner or Rain Bird, and shall be installed inside valve box below grade. Refer to the Irrigation Legend on the Irrigation Plan for proper method of installation.

2.14 IRRIGATION HEADS

A. Refer to irrigation layout plan Legend for all sprinkler heads to be used for project. Only Rain Bird or Hunter, gear-driven rotors will be approved for installation. It is the sole responsibility of the irrigation contractor to verify existing water pressures on site, and install the sprinkler heads such that they provide head-to-head coverage under the recommended guidelines of the sprinkler head manufacturer.

2.15 AIR RELIEF VALVE

A. Refer to the irrigation plan and the irrigation legend for the proper location of the air relief valves for the main line.

PART 3- EXECUTION

3.1 INSPECTIONS:

A. Inspect site conditions, secure and verify exact locations of all underground utility lines and other structures prior to the start of work in this section.

B. Should utilities and other work not shown on the drawings be found during excavation, promptly notify the Landscape Architect. Do not proceed with work until condition is corrected and approved by Owner.

3.2 PREPARATION

A. Cooperate with other sections so that all phases of the project may be properly coordinated without delays or damage to any part of the work.

B. Products and materials shall be kept covered and protected from weather and damaging conditions at all times while in transit and after receipt at the project site.

C. Review drawings for irrigation of turf planting areas and visit the project site to familiarize with the topographical conditions and to ascertain the locations of all drives, walks, planting areas and building locations.

3.3 LAYOUT

A. No consideration will be given to any design changes until the awarding of the contract. Should changes be deemed necessary after award of the contract for proper installation and operation of the system, such changes shall be initiated by the Landscape Architect.

B. Sprinkler heads shown on the diagrammatic only. Establish the location of all sprinkler heads on all grass areas in order to assure proper coverage of all areas. In no case shall spacing of sprinkler heads exceed distances shown on the plans and/or those specified. Pipe sizes shall conform to those shown on the plans. Absolutely no substitutions of smaller pipe size will be allowed, but substitution of larger sizes may be approved.

C. Full, complete; head-to-head coverage is required. Make all necessary minor adjustments in layout to attain required coverage

of areas to be irrigated.

3.4 EXCAVATING AND TRENCHING

A. Perform all excavations as required for installation of work included under this Section, including shoring of earth banks if necessary. Restore all surfaces, existing underground installations, etc. damaged or cut as a result of the excavations to their original conditions.

B. Exercise extreme care in excavating and working near existing utility lines. Verify locations of all existing utility lines prior to start of any excavation works.

C. Dig trenches wide enough to allow a minimum of six inches of distance between parallel pipes. Trenches shall be of a sufficient depth to provide minimum cover from finish grade to top of pipe as follows:

1. Over PVC pipe on the pressure side of irrigation control valves, control wires, and quick coupler valve: 18 inches

2. Over pipe non-pressure side of irrigation control valve: 12 inches

3. All PVC pipe under paving shall be bedded with a minimum of four inches of sand backfill on all sides and have twenty-four inches of cover.

D. Should existing paving require cutting, saw cut paving a minimum of twelve inches wide, compact backfill to ninety five percent dry density, dispose of waste off site, and patch to match existing pavement inm1ediately after work.

E. Trenches for plastic pipe shall be excavated of sufficient depth and width to permit proper handling and installation of the pipe and fittings. The backfill shall be thoroughly compacted in six-inch layers by water tamping, vibratory compactor with a packing foot narrower than the width of the trench, or other method to be approved by the Landscape Architect. The backfilling process shall be deemed complete when all of the excavated material is returned to the trench and the trench is compacted and level with the adjacent soil. All trenches that are opened during any particular working day shall be closed and backfilled the same day. No open trenches or partially backfilled trenches shall be left

overnight except when required for inspection.

F. If trenching is to be executed where there is an existing root zone for new turf the backfilling process shall be executed as previously outlined whereby the top layer of the restored trench consists of the root zone material in its original thickness and depth.

3.5 WATER METER

A. Water meter shall be installed as per the requirements of the local water district and all applicable local plumbing code. The size of the water meter shall be as noted on the drawings.

3.6 BACKFLOW PREVENTION DEVICES AND MAINLINE CONNECTION:

A. Make all required connections to water meter. Backflow prevention device(s) shall be installed according to local codes and manufacturer's latest printed specifications and instructions.

B. The backflow prevention device(s) shall be installed at a required grade as per plumbing codes. All exposed main line and mainline risers above PVC main elevation shall be type "L" copper pipe. Install one brass union in the riser downstream of device.

C. Install gate valve at all com1ection points, size valve same as main line. Verify locations shown on plans.

3.7 LINE INSTALLATION:

A. All pipe, fittings, and valves, etc. shall be carefully placed in the trenches. Interior of pipes shall be kept free from dirt and debris and when pipe laying is not in progress, open ends of pipe shall be closed by approved means.

B. The first phase of the irrigation installation shall involve the installation of the water meter(s) and backflow device(s), the main lines, valves, wiring, lateral lines, swing joints, and controller(s) only. After the root zone has been installed onto the sports fields and rough graded the irrigation contractor shall return to site and excavate by hand where each head is to be installed, flush each zone, install each sprinkler head, and restore whereby the top of the sprinkler heads is one-half inch above existing rough grade, and the adjacent soil is compacted by hand as outlined in Section 3.4. The sprinkler heads are to be clearly with minimum of 12" tall flags to allow visibility for the finish grading process.

C. Lateral lines - All trenches shall be hand-cleaned using trenching shovels after excavation and trench bottom shall remain clean until after the pipe has been installed. All piping on the non-pressure side of the irrigation valves shall be covered with at least 2 inches of soil free from rocks or clods in excess of one inch in diameter.

D. Main lines - All main line trenches shall be hand-cleaned using trenching shovels after excavation. Clean masonry sand shall be installed and leveled by hand to a thickness of not less than three inches prior to installation of the main line. After the main line pipe has been installed a layer of masonry sand shall be installed over the top of the pipe to a thickness of approximately six inches, and hand-leveled, prior to restoration.

E. All lateral connections to the main line and all other connections shall be made to the side of the mainline pipe. No c01mections to the top of the main line shall be allowed.

F. Plastic pipe shall be installed in a way so as to provide for expansion and contraction as recommended by the manufacturer.

G. Plastic pipe shall be cut with PVC pipe cutters or hacksaw, or in a manner so as to ensure a square cut. Burrs at cut ends shall be removed prior to installation so a smooth unobstructed flow will be obtained.

H. All plastic-to-plastic joints except where threaded adaptors are used for connection to valves shall be solvent weld joints except on main lines larger than two inch. Main line piping larger than two inch shall have gasket joints and all fittings shall be ductile iron fittings with joint restraints. Female threads on plastic fittings on the pressure side of the control valves will not be accepted or approved.

I. Concrete thrust blocks shall be installed at all elbows, tees, and dead-ends of the main line. Thrust blocks sl1all confom1 to the standards and guidelines required by the City of Edinburg Specifications. Thrust blocks must be approved by the Landscape Architect prior to backfilling.

J. Trenching within thirty-six inches from a future fence line, warning track, backstop, dugout or similar structure will not be permitted. For irrigation zones along such barriers, the lateral line must be

trenched parallel to the row of sprinkler heads and tees shall be incorporated to allow a perpendicular pipe to extend to the swing joint for the sprinkler head. Lateral lines shall not be permitted under infield skinned area and warning track unless approved by the Landscape Architect prior to installation.

3.8 SOLVENT-WELDED JOINTS FOR PVC PIPES:

A. Use solvents and methods specified by pipe manufacturer.

B. Thoroughly clean the mating pipes and fittings with a clean, dry cloth.

C. After cleaning and drying with a cloth, apply an even coat of approved primer to the outside of the male surface of the pipe, then the inside of the female surface of the fitting. Allow primer to dry for approximately thirty seconds before applying solvent.

D. After priming has been completed apply solvent as follows:
1. Pipes ¾" – 1-½" : Apply one even coat of solvent around the outside of the pipe, then one even coat on the inside of the fitting, then insert pipe into fitting to the full depth of the fitting, rotate one-quarter of a turn and hold in place for one minute. Fitting must be oriented prior to insertion of pipe such that it is oriented properly after one-quarter turn has been executed.

2. Pipes 2" and larger: Apply one even coat of solvent around the outside of the pipe, then one even coat on the inside of the fitting. Then repeat. Insert pipe into fitting to the full depth of the fitting, rotate one-quarter turn, and hold in place for at least one minute. Fitting must be oriented prior to insertion of pipe such that it is oriented properly after one-quarter turn has been executed.

3. Cure joints a minimum of one hour before applying any external stress on the piping and at least twenty-four hours before placing the joint under water pressure.

3.9 THREADED JOINTS FOR PVC PIPES

A. Use Teflon tape on the treaded PVC fittings for the control valves and gate valves. Follow the reconm1ended procedures specified by the valve manufacturers.

B. Use strap-type friction wrench only on plastic fittings. Do not use metal-jawed wrench on plastic fittings.

C. When connection is plastic to metal, male adapters shall be used. The male adapter shall be hand tightened plus one tum with a strap wrench. Joint compound shall be Teflon tape or equal.

3.10 GATE VALVES

A. Group valves together and locates in planting areas whenever possible except inside the field of play for the athletic fields.

3.11 REMOTE CONTROL VALVES

A. Unless otherwise specified, the installation of all valves shall include the excavation and backfill, the furnishing, installing, and testing of risers, fittings and valves, and the removal and/or restoration of existing improvements and all other work in accordance with the plans and specifications and as required for the completed installation.

B. Valve installation shall include setting of the specified valve box to the proposed grade. All valves shall be teed off the main line to facilitate setting the valve at the proper depth for the lateral line to be level and not in a binding position.

C. No valves shall be located inside the fences for the baseball and softball fields except for the quick coupler valves. No valves shall be located inside the field of play for soccer or football fields.

D. Install valves and valve boxes where shown on the drawings but not within eighteen inches to curbs, sidewalks, building structures, or fences. Upon completion the top of the valve boxes shall be flush with grade.

3.12 AUTOMATIC IRRIGATION CONTROLLER(S):

A. Install per code and manufacturer's latest printed instructions.

B. Verify exact location of irrigation controller on project site. Refer to electrical drawings for location of electrical hookup, which is specifically provided for the controller(s).

C. Connect remote control valves to controller in a logical sequence such that each athletic field involves consecutive and orderly stations.

D. Refer to the drawings for implementation of rain sensor(s) and install according to manufacturer's recommendations should sensors be specified on the drawings.

3.13 QUICK COUPLER VALVES:

A. Install quick coupling valves inside 10" round valve box. A one-inch, schedule 80 swing joint with o-rings must be incorporated in the quick coupler connection. A one-inch gate valve must be used in between the swing joint and the quick coupler. Install a ½"' by 24" long rebar vertically adjacent to the quick coupler/gate valve assembly and affix assembly to the rebar using two, stainless steel, heavy duty hose clamps. Gate valve must be easily accessible by hand to operate freely upon completion. Top of quick coupler valve must be set not more than one inch below the top of the valve box so that the handle of the quick coupler key does not interfere with the valve box upon rotation and insertion. Fill bottom of valve box with two inches of pea gravel.

B. Irrigation contractor must provide one quick coupler key and hose swivel adapter per field to project owner upon completion of irrigation.

3.14 SPRINKLER HEADS

A. Sprinkler heads shall be installed after swing joints have been dug up and zone lines have been flushed. This process shall occur after root zone has been installed and rough graded, and prior to finish grading. Soil and root zone around heads shall be hand tamped and compacted. Heads must be set perpendicular to grade and top of head to be set one-half inch above rough grade. Heads are to be clearly flagged to allow visibility during the finish grading process.

B. Sprinkler heads adjacent to fences, walls, warning tracks, infield skinned area, dui baselines, etc.

C. After the finish grading is complete, the irrigation contractor must return and reset each sprinkler head, compact the surrounding area and assure that the top of each head is set three-quarters of

an inch above the finish grade of the root zone. Each zone must be tested at this time and coverage must be checked in its entirety. The arcs of the heads must be checked and adjusted as well.

D. The adjusting screws for each sprinkler head must be adjusted if necessary to assure that proper coverage is achieved.

E. Irrigation contractor to provide two extra sprinkler heads of each type for this project to the project Owner.

3.15 CONTROL WIRES

A. Install control wires with irrigation mains and laterals in common trenches wherever possible. Lay to the side of the pipeline. Snake wires in trench to allow for contraction of wires. Tie wire in bundles often foot intervals with%" black, electrical tape.

B. Control wire splices at remote control valves to be connected using approved watertight wire connectors. There must be sufficient length of control wire used to allow connection to be pulled vertically at least ten inched from the valve box to access the connection. The wire grouping must be neatly coiled into one-inch diameter coils and placed neatly inside the valve box next to the remote valve with the wire connectors oriented vertically.

C. Line splices will be allowed only on runs of more than five hundred feet. Any line splices must be located inside a ten-inch valve box and labeled properly on the as-built drawings.

D. There shall be two extra wires installed from the controller(s) to the farthest valve on each field. These extra wires must be identified and neatly coiled inside the valve box. The valve boxes with the extra wires must be noted on the as-built drawings.

3.16 CLOSING AND FLUSHING OF LINES

A. Cap or plug all openings as soon as lines have been installed to prevent entrance of materials that would obstruct the pipe. Leave in place until removal is needed for completion of installation.

B. The end of each swing joint must be wrapped with plastic and taped during installation prior to the installation of the root zone.

The swing joint must be oriented such that the opening is pointed upward and the area around the swing joint must be filled with masonry sand.

C. Operate each valve manually to permit water to enter the corresponding lateral lines for a given zone. Shut valve off and look for water to bubble up from above each swing joint. Hand-excavate at each swing joint and expose each swing joint in preparation for flushing the zone lines. After all of the swing joints for a given zone have been exposed flush the zone with water. Install the head closest to the remote valve first and flush again. Install the second closest head to the remote valve and flush again. Repeat this procedure until all heads are installed on that zone. Repeat for all zones.

D. Refer to Section 3.14 for proper restoration around sprinkler heads.

3.17 TESTING

A. Pressurizing the main line:
   1. After all of the remote control valves, the quick coupler valves, and the air vent(s) have been installed on the main line, close the ball valves at each backflow prevention device.
   2. Slowly open the water meter and allow the main line to pressurize between the meter and the backflow prevention device. Do not allow more than ten gallons of water per minute to flow while pressurizing the main line.
   3. Slowly open the backflow prevention device to allow the main line between the device and the valves to begin pressurizing. Do not allow more than ten gallons of water per minute to enter the main line during pressurization.
   4. After the main line is pressurized and no water is flowing through the meter close the flow control on each remote control valve. Manually operate each remote control valve and slightly open the flow control to allow air to escape through the valve into the lateral piping. When the air has escaped the valve and water is heard entering the valve manually shut off the valve. Repeat this process for each valve.
   5. After the system has been pressurized close the one-inch gate valve located below each quick coupler. Insert a coupler key into the quick coupler and slowly open the gate valve below to allow air to escape. Close the gate valve after the air has escaped. Repeat this procedure for each quick coupler valve.

6. With the gate valve closed, remove the quick coupler closest to the water source and install an oil-filled water pressure gauge in place of the quick coupler. The gauge must be easily legible above grade.
7. Choose another quick coupler location and make sure the gate valve below it is closed. Remove the quick coupler and attach the appropriate fittings using Teflon tape to allow the connection of a 100-PSI air compressor.
8. Shut off the gate valve located after the water meter to isolate the water meter from the pressure test. Shut off the ball or gate valve on the exhaust side of the backflow device.
9. Pressurize the main line to a minimum of 100 PSI using the air compressor. When the main has reached at least 100 PSI, close the gate valve below where the compressor is connected to the quick coupler fitting. Pressure must maintain a constant pressure of not less than 100 PSI for a period of one hour without deviation.
10. All testing shall be coordinated with the Landscape Architect and conducted in the presence of proper personnel to be specified by the Landscape Architect.
11. The hydrostatic pressure testing may be executed in sections to allow for timely restoration of the irrigation installation. A multi-step plan must be submitted and approved by the Landscape Architect prior to execution.

3.18 BACKFILL AND COMPACTING:

A. Pressurized Mains:

1. Prior to hydrostatic testing the main lines may be partially backfilled with masonry sand to a level not less than four inches and not more than 8 inches above the main line pipe.
2. After testing has been completed and approved by the Landscape Architect the backfilling of the main line trench may proceed.
3. Install six inches of trenched backfill over the top of the masonry sand inside the trench. Compact thoroughly using a motorized compactor with a special foot narrow enough to fit inside the trench. Compact the entire layer prior to filling with more backfill. Repeat this process until restoration is complete. Irrigation contractor is responsible for top dressing or repairing trenches that settle using approved method(s) defined by Landscape Architect for a period of one year as stated in the Warranty.
4. If necessary use the water method of tamping and compaction to assure that the restoration of the trenched

area will compact properly.

B. Lateral Piping:
   1. Backfill the first three inches above the lateral pipe with materials free from rock and other unsuitable substances to prevent damage to the pipe. Backfill to a level six inches above the pipe using the excavated soil and tamp using a motorized compactor as described above. Repeat in layers of six inches until restoration is complete. If necessary use the water method of tamping and compaction to assure that the restoration of the trenched area will compact properly.
   2. Irrigation contractor is responsible for top dressing or repairing trenches that settle using approved method(s) defined by the Landscape Architect for a period of one year as stated in the Warranty.

3.19 WINTERIZING THE SYSTEM

A. The irrigation piping must be winterized by first blowing the system clear of water using compressed air (80 PSI maximum) admitted into the piping at a quick coupler valve located at the highest elevation on the system piping.

B. Activate individual zones first, and then proceed successively through the system towards lower elevations. Proceed through all zones twice. The air compressor used to winterize the system must have an engine separate from the compressor tanks to prevent high temperature air from being directly introduced to the PVC piping.

3.20 FOLLOW-UP AND ADJUSTMENT OF SPRINKLER HEADS:

A. Irrigation contractor shall be on site upon completion of the installation of grass or sprigs at each field to test and adjust sprinkler heads for height relative to the sod or root zone as well as the arc of each head to assure one hundred percent coverage of the new sod or sprigs.

B. Irrigation contractor shall return to check and adjust the head height for each sprinkler head not more than 2 weeks and not less than 3 weeks after the sod or sprigs have been installed for each field.

3.21 CLEAN UP:

A. Irrigation contractor shall keep the premises clean and free of excess equipment, materials, and rubbish incidental to his/her work.

B. Clean up and removal of all deb1is from the entire project site shall be done prior to formal acceptance and approval of work by the Landscape Architect and Owner.

3.21 FINAL ACCEPTANCE

A. The irrigation contractor shall request a substantial completion review from the Landscape Architect. At this review, a "punch list" of items will be generated. Upon completion of these items, the irrigation contractor shall request for a Final Completion Review.

B. Upon final acceptance of the work, the irrigation contractor shall submit to the Owner, an "As Built" irrigation plan based on the record drawing as specified in 1.04 of this specification. The delivery of this As Built Drawing does not relieve the irrigation contractor of the responsibility of furnishing required information that may have been omitted.

C. The irrigation contractor shall also provide the Owner with two copies of the irrigation controller manual, irrigation controller keys, and any specific instruction on the operation of the irrigation system.

D. It is the Turf Contractor's responsibility to determine water application rates and timer cycling. The irrigation contractor will instruct the turf contractor on the operation and programming of the controller and will assist the Turf contractor as necessary in such operations throughout the one year maintenance period. Any adjustments, repairs, etc. other than programming, are the total responsibility of the irrigation contractor.

3.22 WARRANTY

A. The entire irrigation system shall be unconditionally guaranteed by the irrigation contractor as to material and workmanship, including settling of backfilled areas below grade for a period of one year following the date of final acceptance of work and he/she hereby agrees to repair or replace any such defects to the satisfaction of the Owner occurring within that year at his or her expense.

B. It shall be the irrigation contractor's responsibility to insure complete coverage as specified herein of the areas to be irrigated. During the warranty period the irrigation contractor shall make any adjustments as necessary to maintain proper and full coverage.

C. If settlement occurs, or sprinkler heads require adjustments, valves or any other components of the irrigation system require modifications to bring the system, grade or paving (if paving has been cut and patched by irrigation contractor) to the proper level of the permanent grades, these adjustments and modifications shall be done by the irrigation contractor without cost to the Owner.

D. Should any operational difficulties in connection with the irrigation system develop within the specified guarantee period, which, in the opinion of Owner may be due to inferior material and/or workmanship, said difficulties shall be immediately corrected by the irrigation contractor to the satisfaction of the Owner at no additional cost to the Owner, including any and all other damages caused by such defects.

END OF SECTION

SECTION 328420 – IRRIGATION SYSTEM FOR ATHLETIC FIELDS

PART 1 - GENERAL

1.1 QUALIFICATIONS OF IRRIGATION CONTRACTOR:

A. The irrigation contractor's primary business shall be the complete installation of automatic sprinkler systems for athletic fields.

B. The irrigation contractor must be an approved contractor with a minimum of 5 years' experience installing automatic irrigation systems on athletic fields. The irrigation contractor shall submit a list of at least ten athletic fields they have installed irrigation for within the last eighteen months. The irrigation contractor shall provide digital pictures of each of the ten fields taken after completion of the irrigation systems.

C. The irrigation contractor shall provide a list of at least ten references. The references shall be High School, or College Athletic Directors or Head Coaches, and must include their name, telephone number, and description of the athletic field or fields irrigated by the contractor.

D. The irrigation contractor must have a current Irrigation License issued by the State of Texas.

E. The irrigation contractor shall be thoroughly familiar with the type of material specified for the installation and the manufacturers' recommended methods of installation and shall direct the work performed under this section.

1.2 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including and Supplementary Conditions and Division 1 Specification sections, apply to the work of this Section.

1.3 WORK SUMMARY:

A. Furnish all labor, materials, equipment, instruction manuals necessary to install a complete operational automatic irrigation system in strict accordance with specifications and drawings including but not limited to the following:

1. Furnishing and installation of complete automatic irrigation systems to irrigate the athletic fields as illustrated in the construction drawings.
2. Trenching, backfill-and compaction work.
3. Furnishing and installation of a water meter and backflow prevention devices per local code.
4. Installation of sleeves for irrigation piping and remote control wires where shown on drawings.
5. Low voltage wiring as required operating the automatic irrigation controllers including extra wires as specified on drawings.
6. Inspection and tests.
7. Preparation and recording of "as-built" irrigation plans for project Owner's use.
8. Warranty and Guarantees.
9. Maintenance procedures and follow-up adjustments to entire system.

1.4 QUALITY ASSURANCE AND REQUIREMENTS OF REGULATORY AGENCIES:

A. All work and materials shall be in full accordance with latest rules and regulations of safety orders of Division of Industrial Safety, The Uniform Plumbing Code, State Law, and other applicable laws or regulations, including the City of Edinburg Plumbing Codes.

B. Procure all required permits and pay all required fees for water meter taps and backflow devices. Arrange for inspections required by all local agencies and ordinances during the course of work.

C. Nothing in these drawings and specifications shall be construed to permit work not conforming to the governing codes and applicable rules and regulations. Should the contractor documents be at variance with the aforementioned rules and regulations, notify the Landscape Architect and get instructions prior to start of any irrigation related works.

D. Furnish and maintain all necessary warning signs, shoring, red lanterns, barricades, etc. as required by the Safety Orders of the Division of Industrial Safety and Local ordinances.

1.5 SUBMITTALS

A. Submit shop drawings, product data, and installation instructions.

B. Submit a complete materials list of all items proposed to be furnished and installed under this Section.

C. Submit samples of gate valves, pipe, fittings, sprinkler heads, electric irrigation valves, valve boxes, swing joints, and low voltage wire connections.

1.6 RECORD DRAWINGS

A. The contractor shall maintain one record set of blue line prints of the irrigation system in good condition at the site and mark on them the exact "Record". The contractor shall make a daily record of all work installed during each day. Plans shall indicate the exact location of check valves, gate valves, wire locations, head layout, automatic valves, quick couplers, all irrigation piping and wire splices. Locations should be shown by triangular systems of measurements from easily identified, permanent features, such as buildings, curbs, fences, walks, etc. Drawings shall show approved substitutions, if any, of the materials including manufacturers' name and catalog number. Upon completion, all information shall be noted on a clean, legible drawing (to scale) and shall be furnished to the engineers, architect, and owner as "as-built" drawings.

PART 2- PRODUCTS:

2.1 ACCEPTABLE MANUFACTURERS:

A. Products specified are manufactured by Telsco, Excalibur, Sloane, Scotchlock, Carson Industries, King, Rain Bird, Hunter, Lasco, Paigespec, Spears, Matco-Norca, Inc., Cantex, IPS Corporation, Febco, and are listed as a standard of quality.

B. Products of Dixie, Placentia, California, Lasco and Spears conforming to specification requirements are acceptable.

2.2 GENERAL

A. Materials for the irrigation system shall be as indicated on the drawings. All materials shall be new and in perfect working condition.

2.3 PIPE

A. All pipe shall be continuously and permanently marked with

the following information: manufacturer's name or trademark, size, schedule and type of pipe, working pressure at 73 degrees F, and National Sanitation Foundation (NSF). All irrigation pipes shall be installed with the labels oriented on the top surface so that the information can be easily read as viewed from ground level.

B. Piping on pressure side of control valves:
   1. Two inch diameter and smaller and all mains in sleeving shall be Polyvinyl Chloride (PVC) I 120-1220, Schedule 40, and shall conform to ASTM No. 1785-73.
   2. Two and one half inch and larger pipes shall be Polyvinyl Chloride (PVC) 1120-1220 SDR 21.0, Class 200 with rubber gaskets, conforming to ASTM D-1784 and ASTM D-2241. Rubber gasket shall conform to ASTM D-1869 and as provided by pipe manufacturer.
   3. Main lines and lateral lines shall be virgin high impact Polyvinyl Chloride (PVC) pipe and shall have a minimum 200 PSI working pressure rating, NSF approved, and conforming to Commercial Standard 256-63, manufactured by Telsco.

C. Piping on non-pressure side of irrigation control valves.
   1. Polyvinyl Chloride (PVC) 1120-1220, SDR 21.0, Class 200 and conforming to ASTM D-2241-73.
   2. One half-inch pipe shall not be used.
   3. Flexible PVC pipe shall not be used.

2.4 PIPE FITTINGS

A. Fittings for solvent-welded pipe shall be schedule 40, Polyvinyl Chloride, standard weight, as manufactured by "Sloane", Lasco", or approved equal, to meet ASTM D-2466-73 and D-2467-73. Threaded PVC nipples shall be made of Schedule 80.

B. Fittings for swing joints shall be Schedule 80 Polyvinyl Chloride (PVC) with O-rings as manufactured by Lasco or approved equal. Absolutely no flex pipe or polyethylene-type swing joints will be accepted.

C. Solvent cement shall conform to ASTM 1564. Solvent glue shall be IPS Weld-on 700 with a compatible primer, purple in color, or approved equal.

2.5 SLEEVES FOR CONTROL WIRE AND WATER LINE:

A. All conduits and sleeves for irrigation main and laterals shall be 4”

schedule 40 PVC. Sleeves larger than 4" shall be Class 200 PVC. Use 2" Schedule 40 PVC for control wires where it passes under paved surfaces.

2.6 24 VOLT CONTROL WIRES:

A. Wires shall be solid copper, insulated, U>L approved for direct burial in ground. Minimum gauge shall be #14 UF. Common ground wire shall be white.

B. Splicing materials: Schotchlock No. 3576 Sealing Pack, King Wire Connectors, or 3M DBY or DBR connectors.

2.7 VALVE BOXES

A. Valve boxes shall be as manufactured by Carson industries or Ametek, 10" round for gate valves, quick couplers, and remote controlled valves.

B. Valve boxes shall have a black lid. Using stencils and white paint the letters "GV" shall be painted (2" tall) on the lids for gate valves, "QC" for quick couplers, and "RC" for remote controlled valves.

C. Valve boxes for gate valves on the main line shall be supported by a vertical length of 8" PVC pipe such that the valve box is flush with finished grade and the 8" pipe eliminates intrusion of dirt over the valve. Contractor shall provide not less than two valve tools with T-handles of sufficient length to allow operation of the gate valves. Gate valves must be centered inside the 8" vertical pipe to allow easy operation.

2.8 GATE VALVE (SHUT-OFF VALVE)

A. 3" valves and smaller - use 125 pound bronze construction, non-rising stem-type, sized to match the main line size.

B. 4" and larger-

2.9 ELECTRIC VALVES

A. Electric valves shall be Normally Closed, 24 VAC, Rain Bird PEB Series valves.

2.10 BACKFLOW PREVENTION DEVICE

A Shall be as specified on irrigation drawings. Refer to Irrigation Legend for Backflow Prevention Device. The Backflow Prevention Device shall be as manufactured by Febco or approved equal.

2.11 WATER METERS

A Shall be provided and installed by the local water district in accordance with their requirements. The cost of materials and installation shall be included under this Section of Work. Refer to the drawings for the meter size and location.

2.12 IRRIGATION CONTROLLER

A. The irrigation controller(s) shall be a Rainbird ESP-LX Modular Controller or approved equivalent. Refer to the irrigation layout for the location(s) of the controller(s). Irrigation Contractor is responsible for coordination of work necessary to get electrical power to the irrigation controller(s).

2.13 QUICK COUPLING VALVE

A. Shall be 1" as manufactured by Buckner or Rain Bird, and shall be installed inside valve box below grade. Refer to the Irrigation Legend on the Irrigation Plan for proper method of installation.

2.14 IRRIGATION HEADS

A. Refer to irrigation layout plan Legend for all sprinkler heads to be used for project. Only Rain Bird or Hunter, gear-driven rotors will be approved for installation. It is the sole responsibility of the irrigation contractor to verify existing water pressures on site, and install the sprinkler heads such that they provide head-to-head coverage under the recommended guidelines of the sprinkler head manufacturer.

2.15 AIR RELIEF VALVE

A. Refer to the irrigation plan and the irrigation legend for the proper location of the air relief valves for the main line.

PART 3- EXECUTION

3.1 INSPECTIONS:

A. Inspect site conditions, secure and verify exact locations of all underground utility lines and other structures prior to the start of work in this section.

B. Should utilities and other work not shown on the drawings be found during excavation, promptly notify the Landscape Architect. Do not proceed with work until condition is corrected and approved by Owner.

3.2 PREPARATION

A. Cooperate with other sections so that all phases of the project may be properly coordinated without delays or damage to any part of the work.

B. Products and materials shall be kept covered and protected from weather and damaging conditions at all times while in transit and after receipt at the project site.

C. Review drawings for irrigation of turf planting areas and visit the project site to familiarize with the topographical conditions and to ascertain the locations of all drives, walks, planting areas and building locations.

3.3 LAYOUT

A. No consideration will be given to any design changes until the awarding of the contract. Should changes be deemed necessary after award of the contract for proper installation and operation of the system, such changes shall be initiated by the Landscape Architect.

B. Sprinkler heads shown on the diagrammatic only. Establish the location of all sprinkler heads on all grass areas in order to assure proper coverage of all areas. In no case shall spacing of sprinkler heads exceed distances shown on the plans and/or those specified. Pipe sizes shall conform to those shown on the plans. Absolutely no substitutions of smaller pipe size will be allowed, but substitution of larger sizes may be approved.

C. Full, complete; head-to-head coverage is required. Make all necessary minor adjustments in layout to attain required coverage

of areas to be irrigated.

3.4 EXCAVATING AND TRENCHING

A. Perform all excavations as required for installation of work included under this Section, including shoring of earth banks if necessary. Restore all surfaces, existing underground installations, etc. damaged or cut as a result of the excavations to their original conditions.

B. Exercise extreme care in excavating and working near existing utility lines. Verify locations of all existing utility lines prior to start of any excavation works.

C. Dig trenches wide enough to allow a minimum of six inches of distance between parallel pipes. Trenches shall be of a sufficient depth to provide minimum cover from finish grade to top of pipe as follows:

1. Over PVC pipe on the pressure side of irrigation control valves, control wires, and quick coupler valve: 18 inches

2. Over pipe non-pressure side of irrigation control valve: 12 inches

3. All PVC pipe under paving shall be bedded with a minimum of four inches of sand backfill on all sides and have twenty-four inches of cover.

D. Should existing paving require cutting, saw cut paving a minimum of twelve inches wide, compact backfill to ninety five percent dry density, dispose of waste off site, and patch to match existing pavement inm1ediately after work.

E. Trenches for plastic pipe shall be excavated of sufficient depth and width to permit proper handling and installation of the pipe and fittings. The backfill shall be thoroughly compacted in six-inch layers by water tamping, vibratory compactor with a packing foot narrower than the width of the trench, or other method to be approved by the Landscape Architect. The backfilling process shall be deemed complete when all of the excavated material is returned to the trench and the trench is compacted and level with the adjacent soil. All trenches that are opened during any particular working day shall be closed and backfilled the same day. No open trenches or partially backfilled trenches shall be left

overnight except when required for inspection.

F. If trenching is to be executed where there is an existing root zone for new turf the backfilling process shall be executed as previously outlined whereby the top layer of the restored trench consists of the root zone material in its original thickness and depth.

3.5 WATER METER

A. Water meter shall be installed as per the requirements of the local water district and all applicable local plumbing code. The size of the water meter shall be as noted on the drawings.

3.6 BACKFLOW PREVENTION DEVICES AND MAINLINE CONNECTION:

A. Make all required connections to water meter. Backflow prevention device(s) shall be installed according to local codes and manufacturer's latest printed specifications and instructions.

B. The backflow prevention device(s) shall be installed at a required grade as per plumbing codes. All exposed main line and mainline risers above PVC main elevation shall be type "L" copper pipe. Install one brass union in the riser downstream of device.

C. Install gate valve at all com1ection points, size valve same as main line. Verify locations shown on plans.

3.7 LINE INSTALLATION:

A. All pipe, fittings, and valves, etc. shall be carefully placed in the trenches. Interior of pipes shall be kept free from dirt and debris and when pipe laying is not in progress, open ends of pipe shall be closed by approved means.

B. The first phase of the irrigation installation shall involve the installation of the water meter(s) and backflow device(s), the main lines, valves, wiring, lateral lines, swing joints, and controller(s) only. After the root zone has been installed onto the sports fields and rough graded the irrigation contractor shall return to site and excavate by hand where each head is to be installed, flush each zone, install each sprinkler head, and restore whereby the top of the sprinkler heads is one-half inch above existing rough grade, and the adjacent soil is compacted by hand as outlined in Section 3.4. The sprinkler heads are to be clearly with minimum of 12" tall flags to allow visibility for the finish grading process.

C. Lateral lines - All trenches shall be hand-cleaned using trenching shovels after excavation and trench bottom shall remain clean until after the pipe has been installed. All piping on the non-pressure side of the irrigation valves shall be covered with at least 2 inches of soil free from rocks or clods in excess of one inch in diameter.

D. Main lines - All main line trenches shall be hand-cleaned using trenching shovels after excavation. Clean masonry sand shall be installed and leveled by hand to a thickness of not less than three inches prior to installation of the main line. After the main line pipe has been installed a layer of masonry sand shall be installed over the top of the pipe to a thickness of approximately six inches, and hand-leveled, prior to restoration.

E. All lateral connections to the main line and all other connections shall be made to the side of the mainline pipe. No c01mections to the top of the main line shall be allowed.

F. Plastic pipe shall be installed in a way so as to provide for expansion and contraction as recommended by the manufacturer.

G. Plastic pipe shall be cut with PVC pipe cutters or hacksaw, or in a manner so as to ensure a square cut. Burrs at cut ends shall be removed prior to installation so a smooth unobstructed flow will be obtained.

H. All plastic-to-plastic joints except where threaded adaptors are used for connection to valves shall be solvent weld joints except on main lines larger than two inch. Main line piping larger than two inch shall have gasket joints and all fittings shall be ductile iron fittings with joint restraints. Female threads on plastic fittings on the pressure side of the control valves will not be accepted or approved.

I. Concrete thrust blocks shall be installed at all elbows, tees, and dead-ends of the main line. Thrust blocks sl1all confom1 to the standards and guidelines required by the City of Edinburg Specifications. Thrust blocks must be approved by the Landscape Architect prior to backfilling.

J. Trenching within thirty-six inches from a future fence line, warning track, backstop, dugout or similar structure will not be permitted. For irrigation zones along such barriers, the lateral line must be

trenched parallel to the row of sprinkler heads and tees shall be incorporated to allow a perpendicular pipe to extend to the swing joint for the sprinkler head. Lateral lines shall not be permitted under infield skinned area and warning track unless approved by the Landscape Architect prior to installation.

3.8 SOLVENT-WELDED JOINTS FOR PVC PIPES:

A. Use solvents and methods specified by pipe manufacturer.

B. Thoroughly clean the mating pipes and fittings with a clean, dry cloth.

C. After cleaning and drying with a cloth, apply an even coat of approved primer to the outside of the male surface of the pipe, then the inside of the female surface of the fitting. Allow primer to dry for approximately thirty seconds before applying solvent.

D. After priming has been completed apply solvent as follows:
1. Pipes ¾" – 1-½" : Apply one even coat of solvent around the outside of the pipe, then one even coat on the inside of the fitting, then insert pipe into fitting to the full depth of the fitting, rotate one-quarter of a turn and hold in place for one minute. Fitting must be oriented prior to insertion of pipe such that it is oriented properly after one-quarter turn has been executed.

2. Pipes 2" and larger: Apply one even coat of solvent around the outside of the pipe, then one even coat on the inside of the fitting. Then repeat. Insert pipe into fitting to the full depth of the fitting, rotate one-quarter turn, and hold in place for at least one minute. Fitting must be oriented prior to insertion of pipe such that it is oriented properly after one-quarter turn has been executed.

3. Cure joints a minimum of one hour before applying any external stress on the piping and at least twenty-four hours before placing the joint under water pressure.

3.9 THREADED JOINTS FOR PVC PIPES

A. Use Teflon tape on the treaded PVC fittings for the control valves and gate valves. Follow the reconm1ended procedures specified by the valve manufacturers.

B. Use strap-type friction wrench only on plastic fittings. Do not use metal-jawed wrench on plastic fittings.

C. When connection is plastic to metal, male adapters shall be used. The male adapter shall be hand tightened plus one tum with a strap wrench. Joint compound shall be Teflon tape or equal.

3.10 GATE VALVES

A. Group valves together and locates in planting areas whenever possible except inside the field of play for the athletic fields.

3.11 REMOTE CONTROL VALVES

A. Unless otherwise specified, the installation of all valves shall include the excavation and backfill, the furnishing, installing, and testing of risers, fittings and valves, and the removal and/or restoration of existing improvements and all other work in accordance with the plans and specifications and as required for the completed installation.

B. Valve installation shall include setting of the specified valve box to the proposed grade. All valves shall be teed off the main line to facilitate setting the valve at the proper depth for the lateral line to be level and not in a binding position.

C. No valves shall be located inside the fences for the baseball and softball fields except for the quick coupler valves. No valves shall be located inside the field of play for soccer or football fields.

D. Install valves and valve boxes where shown on the drawings but not within eighteen inches to curbs, sidewalks, building structures, or fences. Upon completion the top of the valve boxes shall be flush with grade.

3.12 AUTOMATIC IRRIGATION CONTROLLER(S):

A. Install per code and manufacturer's latest printed instructions.

B. Verify exact location of irrigation controller on project site. Refer to electrical drawings for location of electrical hookup, which is specifically provided for the controller(s).

C. Connect remote control valves to controller in a logical sequence such that each athletic field involves consecutive and orderly stations.

D. Refer to the drawings for implementation of rain sensor(s) and install according to manufacturer's recommendations should sensors be specified on the drawings.

3.13 QUICK COUPLER VALVES:

A. Install quick coupling valves inside 10" round valve box. A one-inch, schedule 80 swing joint with o-rings must be incorporated in the quick coupler connection. A one-inch gate valve must be used in between the swing joint and the quick coupler. Install a ½"' by 24" long rebar vertically adjacent to the quick coupler/gate valve assembly and affix assembly to the rebar using two, stainless steel, heavy duty hose clamps. Gate valve must be easily accessible by hand to operate freely upon completion. Top of quick coupler valve must be set not more than one inch below the top of the valve box so that the handle of the quick coupler key does not interfere with the valve box upon rotation and insertion. Fill bottom of valve box with two inches of pea gravel.

B. Irrigation contractor must provide one quick coupler key and hose swivel adapter per field to project owner upon completion of irrigation.

3.14 SPRINKLER HEADS

A. Sprinkler heads shall be installed after swing joints have been dug up and zone lines have been flushed. This process shall occur after root zone has been installed and rough graded, and prior to finish grading. Soil and root zone around heads shall be hand tamped and compacted. Heads must be set perpendicular to grade and top of head to be set one-half inch above rough grade. Heads are to be clearly flagged to allow visibility during the finish grading process.

B. Sprinkler heads adjacent to fences, walls, warning tracks, infield skinned area, dui baselines, etc.

C. After the finish grading is complete, the irrigation contractor must return and reset each sprinkler head, compact the surrounding area and assure that the top of each head is set three-quarters of

an inch above the finish grade of the root zone. Each zone must be tested at this time and coverage must be checked in its entirety. The arcs of the heads must be checked and adjusted as well.

D. The adjusting screws for each sprinkler head must be adjusted if necessary to assure that proper coverage is achieved.

E. Irrigation contractor to provide two extra sprinkler heads of each type for this project to the project Owner.

3.15 CONTROL WIRES

A. Install control wires with irrigation mains and laterals in common trenches wherever possible. Lay to the side of the pipeline. Snake wires in trench to allow for contraction of wires. Tie wire in bundles often foot intervals with%" black, electrical tape.

B. Control wire splices at remote control valves to be connected using approved watertight wire connectors. There must be sufficient length of control wire used to allow connection to be pulled vertically at least ten inched from the valve box to access the connection. The wire grouping must be neatly coiled into one-inch diameter coils and placed neatly inside the valve box next to the remote valve with the wire connectors oriented vertically.

C. Line splices will be allowed only on runs of more than five hundred feet. Any line splices must be located inside a ten-inch valve box and labeled properly on the as-built drawings.

D. There shall be two extra wires installed from the controller(s) to the farthest valve on each field. These extra wires must be identified and neatly coiled inside the valve box. The valve boxes with the extra wires must be noted on the as-built drawings.

3.16 CLOSING AND FLUSHING OF LINES

A. Cap or plug all openings as soon as lines have been installed to prevent entrance of materials that would obstruct the pipe. Leave in place until removal is needed for completion of installation.

B. The end of each swing joint must be wrapped with plastic and taped during installation prior to the installation of the root zone.

The swing joint must be oriented such that the opening is pointed upward and the area around the swing joint must be filled with masonry sand.

C. Operate each valve manually to permit water to enter the corresponding lateral lines for a given zone. Shut valve off and look for water to bubble up from above each swing joint. Hand-excavate at each swing joint and expose each swing joint in preparation for flushing the zone lines. After all of the swing joints for a given zone have been exposed flush the zone with water. Install the head closest to the remote valve first and flush again. Install the second closest head to the remote valve and flush again. Repeat this procedure until all heads are installed on that zone. Repeat for all zones.

D. Refer to Section 3.14 for proper restoration around sprinkler heads.

3.17 TESTING

A. Pressurizing the main line:
   1. After all of the remote control valves, the quick coupler valves, and the air vent(s) have been installed on the main line, close the ball valves at each backflow prevention device.
   2. Slowly open the water meter and allow the main line to pressurize between the meter and the backflow prevention device. Do not allow more than ten gallons of water per minute to flow while pressurizing the main line.
   3. Slowly open the backflow prevention device to allow the main line between the device and the valves to begin pressurizing. Do not allow more than ten gallons of water per minute to enter the main line during pressurization.
   4. After the main line is pressurized and no water is flowing through the meter close the flow control on each remote control valve. Manually operate each remote control valve and slightly open the flow control to allow air to escape through the valve into the lateral piping. When the air has escaped the valve and water is heard entering the valve manually shut off the valve. Repeat this process for each valve.
   5. After the system has been pressurized close the one-inch gate valve located below each quick coupler. Insert a coupler key into the quick coupler and slowly open the gate valve below to allow air to escape. Close the gate valve after the air has escaped. Repeat this procedure for each quick coupler valve.

6. With the gate valve closed, remove the quick coupler closest to the water source and install an oil-filled water pressure gauge in place of the quick coupler. The gauge must be easily legible above grade.
7. Choose another quick coupler location and make sure the gate valve below it is closed. Remove the quick coupler and attach the appropriate fittings using Teflon tape to allow the connection of a 100-PSI air compressor.
8. Shut off the gate valve located after the water meter to isolate the water meter from the pressure test. Shut off the ball or gate valve on the exhaust side of the backflow device.
9. Pressurize the main line to a minimum of 100 PSI using the air compressor. When the main has reached at least 100 PSI, close the gate valve below where the compressor is connected to the quick coupler fitting. Pressure must maintain a constant pressure of not less than 100 PSI for a period of one hour without deviation.
10. All testing shall be coordinated with the Landscape Architect and conducted in the presence of proper personnel to be specified by the Landscape Architect.
11. The hydrostatic pressure testing may be executed in sections to allow for timely restoration of the irrigation installation. A multi-step plan must be submitted and approved by the Landscape Architect prior to execution.

3.18 BACKFILL AND COMPACTING:

A. Pressurized Mains:

1. Prior to hydrostatic testing the main lines may be partially backfilled with masonry sand to a level not less than four inches and not more than 8 inches above the main line pipe.
2. After testing has been completed and approved by the Landscape Architect the backfilling of the main line trench may proceed.
3. Install six inches of trenched backfill over the top of the masonry sand inside the trench. Compact thoroughly using a motorized compactor with a special foot narrow enough to fit inside the trench. Compact the entire layer prior to filling with more backfill. Repeat this process until restoration is complete. Irrigation contractor is responsible for top dressing or repairing trenches that settle using approved method(s) defined by Landscape Architect for a period of one year as stated in the Warranty.
4. If necessary use the water method of tamping and compaction to assure that the restoration of the trenched

area will compact properly.

B. Lateral Piping:
   1. Backfill the first three inches above the lateral pipe with materials free from rock and other unsuitable substances to prevent damage to the pipe. Backfill to a level six inches above the pipe using the excavated soil and tamp using a motorized compactor as described above. Repeat in layers of six inches until restoration is complete. If necessary use the water method of tamping and compaction to assure that the restoration of the trenched area will compact properly.
   2. Irrigation contractor is responsible for top dressing or repairing trenches that settle using approved method(s) defined by the Landscape Architect for a period of one year as stated in the Warranty.

3.19 WINTERIZING THE SYSTEM

A. The irrigation piping must be winterized by first blowing the system clear of water using compressed air (80 PSI maximum) admitted into the piping at a quick coupler valve located at the highest elevation on the system piping.

B. Activate individual zones first, and then proceed successively through the system towards lower elevations. Proceed through all zones twice. The air compressor used to winterize the system must have an engine separate from the compressor tanks to prevent high temperature air from being directly introduced to the PVC piping.

3.20 FOLLOW-UP AND ADJUSTMENT OF SPRINKLER HEADS:

A. Irrigation contractor shall be on site upon completion of the installation of grass or sprigs at each field to test and adjust sprinkler heads for height relative to the sod or root zone as well as the arc of each head to assure one hundred percent coverage of the new sod or sprigs.

B. Irrigation contractor shall return to check and adjust the head height for each sprinkler head not more than 2 weeks and not less than 3 weeks after the sod or sprigs have been installed for each field.

3.21 CLEAN UP:

A. Irrigation contractor shall keep the premises clean and free of excess equipment, materials, and rubbish incidental to his/her work.

B. Clean up and removal of all deb1is from the entire project site shall be done prior to formal acceptance and approval of work by the Landscape Architect and Owner.

3.21 FINAL ACCEPTANCE

A. The irrigation contractor shall request a substantial completion review from the Landscape Architect. At this review, a "punch list" of items will be generated. Upon completion of these items, the irrigation contractor shall request for a Final Completion Review.

B. Upon final acceptance of the work, the irrigation contractor shall submit to the Owner, an "As Built" irrigation plan based on the record drawing as specified in 1.04 of this specification. The delivery of this As Built Drawing does not relieve the irrigation contractor of the responsibility of furnishing required information that may have been omitted.

C. The irrigation contractor shall also provide the Owner with two copies of the irrigation controller manual, irrigation controller keys, and any specific instruction on the operation of the irrigation system.

D. It is the Turf Contractor's responsibility to determine water application rates and timer cycling. The irrigation contractor will instruct the turf contractor on the operation and programming of the controller and will assist the Turf contractor as necessary in such operations throughout the one year maintenance period. Any adjustments, repairs, etc. other than programming, are the total responsibility of the irrigation contractor.

3.22 WARRANTY

A. The entire irrigation system shall be unconditionally guaranteed by the irrigation contractor as to material and workmanship, including settling of backfilled areas below grade for a period of one year following the date of final acceptance of work and he/she hereby agrees to repair or replace any such defects to the satisfaction of the Owner occurring within that year at his or her expense.

B. It shall be the irrigation contractor's responsibility to insure complete coverage as specified herein of the areas to be irrigated. During the warranty period the irrigation contractor shall make any adjustments as necessary to maintain proper and full coverage.

C. If settlement occurs, or sprinkler heads require adjustments, valves or any other components of the irrigation system require modifications to bring the system, grade or paving (if paving has been cut and patched by irrigation contractor) to the proper level of the permanent grades, these adjustments and modifications shall be done by the irrigation contractor without cost to the Owner.

D. Should any operational difficulties in connection with the irrigation system develop within the specified guarantee period, which, in the opinion of Owner may be due to inferior material and/or workmanship, said difficulties shall be immediately corrected by the irrigation contractor to the satisfaction of the Owner at no additional cost to the Owner, including any and all other damages caused by such defects.

END OF SECTION

(Referenced from 2004 TxDOT, ITEM 204 Sprinkling – references made to any other Sections of the 2004 TxDOT Manual shall become part of the Contract to be followed)

00204.1. Description. Apply water for dust control, earthwork, or base construction.

00204.2. Materials. Furnish water free of industrial wastes and other objectionable matter.

00204.3. Equipment. Use sprinklers and spray bars equipped with positive and rapidly working cut-off valves.

00204.4. Construction. Apply water at a uniform rate and in the required quantity, or as directed.

00204.5. MEASUREMENT AND PAYMENT

A. When listed as a separate contract pay item, shall be measured in accordance with "Measurement and Basis of Payment" section or as shown on the Bid Proposal Form.

B. When not listed as a separate contract pay item, shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 329000 – PLANTING

PART 1 - GENERAL

1.1 SCOPE

A. Supply and installation of all approved materials, labor, equipment, transportation and services required and incidental thereto, in conformity with the plans and specifications, including but not limited to: vegetation protection/pruning, fine grading, earth mounding, bed excavation and preparation, bed edging, planting soil/mixes, fertilizer, mulch, trees, palms, shrubs, ground covers, staking, paving, clean-up, maintenance, and warranty.

B. Related Sections:
   1. Irrigation – 32 80 00
   2. Lawns – 32 92 00

1.2 REFERENCE STANDARDS

A. General: "Hortus Third," 1976

B. Texas Association of Nurserymen, Grades and Standards for Nursery Stock

C. Plant Material: "American Standard for Nursery Stock," ANSI Z60.1-1990

D. National Arborist Association Standards

1.3 DEFINITIONS

A. Specimen Plants: Plants having exceptional character, superiority in form and branching, and the best attributes of the species; all as determined by the Engineer, Landscape Designer or Owner.

1.4 QUALIFICATIONS

A. Landscape work to be performed by a single firm specializing in commercial landscape work with a minimum of five (5) years' experience on similar type projects. Owner to review qualifications and approve subcontractor prior to commencing work.

1.5 SUBMITTALS

A. Submittals shall be formatted in a three-ring binder or digitally with tabs identifying each section. Landscape submittals shall also include submittal requirements for Section 32 80 00-Irrigaion, 32 14 13-Unit Pavers, and 32 92 00-Lawns. The following submittals are required for this section:
   1. Landscape Construction Schedule
   2. Edging
   3. Post Emergent Herbicides
   4. Pre-Emergent Herbicides
   5. Soils, Compost and Mulch
   6. Sources of all Plant Materials (including address and telephone numbers)
   7. Product Data Material Safety Data Sheets
   8. Paving Materials
   9. Lawns (fertilizers, herbicides, maintenance)
   10. Irrigation Product Information
   11. Samples: One foot section of edging (as specified on plans), one pound bag sample of each; topsoil, lightweight planting mix, premium compost and mulch.
   12. Name of Subcontractor for pruning trees (Certified I.S.A Arborist)

1.6 PROTECTION

A. Before commencing work, contractor shall place orange construction fencing around all vegetation labeled “to remain” on landscape plans. Fencing shall be placed squarely around each tree 6’ x 6’ and at least 60” in height or continuously around groups of vegetation as shown on plans. No work may begin until this requirement is fulfilled. All other vegetation not labeled “to remain” shall be cleared and grubbed including root systems.

B. In order to avoid damage to roots, bark or lower branches, no truck or other equipment shall be driven or parked within the drip line of any tree, unless the tree overspreads a paved way.

C. The Contractor shall use any and all precautionary measure when performing work around trees, walks, pavements, utilities, and any other features either existing or previously installed under this Contract.

D. The Contactor shall adjust depth of earthwork and loaming when working immediately adjacent to any of the aforementioned features in order to prevent disturbing tree roots, undermining walks and pavements, and damage in general to any existing or newly incorporated item.

E. Where excavating, fill or grading is required within the branch spread of trees that are to remain, the work shall be performed as follows:
   1. Trenching: When trenching occurs around trees to remain, the tree roots shall not be cut but the trench shall be tunneled under or around the roots by careful hand digging and without injury to the roots.
   2. Raising Grades: When the existing grade at tree is below the now finished grade, and fill not exceeding sixteen (16") inches is required, clean, washed gravel graded from one to two inches (1" - 2") in size shall be place directly around the tree trunk. The gravel shall extend out from trunk on all sides a minimum of eighteen (18") inches and finish approximately two (2") inches above the finished grade at tree. Install gravel before any earth fill is placed. New earth fill shall not be left in contact with the trunks of any trees requiring fill. Where fill exceeding sixteen (16") inches is required, a dry laid tree well shall be constructed around the trunk of the tree. The tree well shall extend out from the trunk on all sides a minimum of three (3') feet and to three (3") inches above finish grade. Coarse grade rock shall be placed directly around the tree well extending out the drip line of the tree. Clean, washed gravel graded from one to two (1" – 2") inches in size shall be placed directly over the coarse rock to the depth of three (3") inches. Approved backfill material shall be placed directly over the washed grave to desired finished grade
   3. Lowering Grades: Existing trees in areas where the now finished grade is to be lowered shall have regarding work done by hand to elevation as indicated. Roots as required shall be cut cleanly three (3") inches below finished grade and scars covered with tree paint.
   4. Trees marked for preservation that are located more than six (6") inches above proposed grades shall stand on broad rounded mounds and be graded smoothly into the lower level. Trees located more than sixteen (16") inches above proposed grades shall have a dry laid stonewall, or other retaining structure as detailed on the plans, constructed a minimum of five (5') feet from the trunk. Exposed or broken roots shall be cut clean and covered with topsoil.

F. Contractor is responsible for all protection measures listed above. If these procedures are not followed, contractor is responsible for replacement of existing trees and approved trees of equal caliper and height.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Transport plant materials covered or in closed vehicles to protect from exposure to heat and wind. Spray trees and in full leaf with anti-desiccant as recommended by the manufacturer, before shipping. Take precautions to protect plant materials from desiccation and from damage to bark, branches and roots. Do not allow root balls to crack. Schedule shipments to coincide with planting work schedule.

B. Storage and Protection: If planning is delayed after delivery, keep plants in a shaded area, cover roots with mulch or topsoil, and keep plants constantly watered until planted.

1.8 MAINTENANCE/WARRANTY

A. Maintenance Requirements: Maintain the work of this Section for ninety (90) days after "substantial completion" and until final written acceptance by Owner. Notify the owner in writing of "substantial completion". Maintenance period begins after owner's written acceptance of "substantial completion".

B. Maintenance Service: Perform the following maintenance operations at least one a week:
   1. Remove and replace dead plant material. Prune plants to remove dead wood and to maintain health of plants.
   2. Maintain all mulched areas at a two (2") inch depth. Remove weeds and grass from shrub and ground cover areas and from watering basins.
   3. Provide insect and disease control to maintain health of plants.
   4. Irrigation:
      a. If the irrigation system is operating, program and monitor the system to provide adequate water for plants.
      b. If the irrigation system is not operating, hand water plants. Deep water trees each week.
   5. Dispose of all maintenance debris/clippings off-site. Owner's dumpsters shall not be used.
   6. Keep all site areas tidy and free of grass clippings, mulch or other foreign materials.
   7. Submit receipts/dates of all maintenance operations to Owner/Engineer for approval.
   8. Remove staking materials at end of maintenance period and deliver to Owner.

C. Warranty: Warranty shall cover all shrubs/groundcovers for a period of three (3) months and trees/palms for a period of one (1) year from the

date of final acceptance. Any plant material deemed dead or unrecoverable by the owner shall be replaced with similar species and size within two weeks of notification from owner.

1.9 RIGHT OF REJECTION

A. The Owner/Engineer reserves the right to inspect and reject plants at any time and at any place.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fertilizer: 13 13 13 Osmocote slow release fertilizer granules, or approve equal.

B. Planting Tablets: Agraform 21 gram slow release fertilizer tablets, or approved equal.

C. Compost: Premium grade compost (Earthwise Organics, or approved equal).

D. Topsoil: Fertile, agricultural soil, typical for locality capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds, and roots; minimum pH value of 5.4 and maximum 7.0; organic matter to exceed 1.5%, magnesium to exceed 100 units; phosphorus to exceed 150 units; potassium to exceed 120 units; soluble salts/conductivity not to exceed 900 ppm/0.9 mmhos/cm in soil.

E. Mulch:
   1. Shrub and Ground Cover Planting Areas: Grade A Shredded Hardwood; long, fibrous bark strands free from wood chips. Texas Natives, or approved equal.
   2. Watering Basins: Grade A Shredded Hardwood; long, fibrous bark strands free from wood chips. Texas Natives, or approved equal.

F. Plants:
   1. General: Provide plant materials that are healthy and free from disease, insects, and larvae and without damage to bark, branches and roots. Refer to drawings for landscape type and set up.

2. Approval: All trees/palms must be inspected, approved and tagged by Owner at their place of origin or as directed in writing by Owner.
3. Sizes: Measured after pruning and in accordance with the plant schedule.
4. Root Treatment: As follows in accordance with the Reference Standards:
   a. Palms: Balled and burlapped or containerized if they have been in the container for at least one growing season.
   b. Trees, Shrubs, Ground Cover Plants: Container grown with a well-established fibrous root system.
5. Palms: All new palms shall be field dug or containerized material in specified sizes in plant schedule. All palms shall have good form (straight trunks) consistent of this species, free of scares/abrasions/burn marks and disease and insects, with large healthy root systems.

G. Staking Material:
1. Stakes shall be commercial grade T-Posts, 1.25 Gauge, 8' Ht., Green with orange safety caps on tops. Note: Do not drive through stakes through root balls.
2. Tree ties shall be Poly Chain Lock – 1" width, black, ProLock or approved equal.
3. Stakes shall be hardwood 2 x 2's or commercial grade T-Stakes (do not drive through rootball).

H. Edging:
1. Concrete Edging: Extruded, colored, fibermesh reinforced concrete edging (per details) Curb Appeal, or approved equal.
2. Tree Rings: 5" x 30" Black Anodized Aluminum tree rings (painted b lack or green). Dreamscapes, or approved equal.
3. Aluminum Edging: 5" commercial grade black anodized aluminum edging (black anodized). Dreamscapes, or approved equal.

2.2 PLANTING SOILS

A. Planting Mix: 75% Sandy-Loam Topsoil; 25% Premium Compost; (3:1 ratio by volume); and specified fertilizer or planting tablets.

B. Shrub and Ground Cover Areas:
1. Where topsoil has been installed: Apply one (1") inch layer in planting bed; till into the top six inches of soil.

2. Where no topsoil has been installed: Remove twelve inches of existing soil and replace with ten inches of "Planting Mix" as described in Item "A" above.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine the site and conditions under which landscape work is to be performed. Have the installer notify the Contractor in writing, with a copy of drawings if the site if unsatisfactory. Do not begin the work until unsatisfactory conditions have been corrected in a manner acceptable to installer. Beginning of work indicates acceptance of the site as satisfactory by the installer.

3.2 EXECUTION

A. Site Preparation: Contractors must visit and review site prior to bidding. Compacted soils and sub-soils from construction activities must be ripped and tilled until a loose, friable and free-draining condition is met. All existing weeds, grass, stabilized sub-base material, rubble, excavated soil and other material shall be removed from the site and disposed of by the contractor prior to starting any new landscape work. Soil conditions around entire site must be approved by Owner prior to rough and finished grading operations. Contractor shall not install any fill or topsoil in landscape areas prior to site condition approval by Owner.

B. Drainage: Landscape contractor shall follow grading as shown and specified on Civil Engineer's grading plans. Landscape Contractor shall coordinate grading operations with site contractor. Landscaper Contractor shall ensure final grades conform to the Civil Engineer's grading plan including grades around buildings, swales, sidewalk under drains/swales, roof drains, splash blocks and rock swales through planting beds.

C. Vegetation Protection: Contractors are responsible for protection of existing vegetation labeled on plans "to remain". Protection of existing vegetation includes supply and installation of protective fencing around all existing planting areas.

D. Bed Preparation and herbicide: All planting areas shall be free of weeds, grass insects, or any other deleterious material prior to bed

preparation. Contractor shall herbicide all planting areas with "Round-Up" or approved equal at least two times prior to installation of any new plants. Pre-emergent herbicide shall be applied after planting and before placement of mulch.

E. Planting Beds: Excavate 12" of existing soil within planting beds and replace with 8" of imported topsoil and 2" of premium compost. Mechanically till into top six inches of bed until a loose, friable soil condition is met. Final grades within all planting beds shall be 2-3" below adjacent curbs to allow for mulch. Contractor to ensure positive drainage throughout entire landscape areas. Adjust grades as necessary to direct water away from planting beds. Report any discrepancies on all drainage issues in writing to Construction Manager or to the Engineer. Owner or Engineer will approve planting beds prior to planting operations.

F. Edging: Edging shall be installed as shown on plans. Edging shall allow for tapered drainage points to ensure free drainage away from all structures and walkways. Edging shall be set flush with adjacent paving, sidewalks or driveways.

G. Grass Areas: Scarify, float and fine grade all areas to receive sod or hydromulch for approval by Construction Manager prior to placement of sod or application of hydromulch. Supply additional topsoil as necessary to fill any/all low areas and ensure positive drainage away building/planting beds.

H. Berms and Mounding: Supply topsoil and construct berms as indicated on plans. Berms shall have a maximum slope of 1:4. Owner or Engineer shall approve berms and mounding prior to planting operations.

I. Planting:
   1. Installation:
      a. Excavate planting pit to depth and width indicated on Drawings.
      b. Set root ball on undisturbed or compacted soil in planting pit. Remove burlap, rope, wire, and all other wrapping material from top of ball. Remove any binding rope which is not biodegradable completely.
      c. Fill planting pit 2/3 full with planting mix, soak with water and allow settling, and adding fertilizer tablets as detailed. Finish filling pit with planting mix and tamp lightly.

d. Construct a watering basin as detailed and install 2" of mulch. Water-in to completely saturate the root ball and planting mix. Add planting mix where any settling or air pockets occur.
e. Stake all trees/palms immediately after planting as detailed.

2. Planting Holes: All planting holes shall be excavated with a diameter at least two times the rootball size and to the depth equal to the height of the roofball. The bottoms and sides of each hole shall be scarified with a pick to allow for free drainage and maximum root penetration. After plant placement, the hole shall be backfilled with mixture of excavated soil and premium compost mixture (Earthwise Organics "RGV" Mix, or approved equal. All holes shall be tested/inspected by Engineer for free drainage prior to installation of trees.

3. Watering Basins: Watering basins for all plants shall be constructed in a ring shape around each tree or palm trunk. This earthen berm shall be constructed 6" in height and 36" in diameter so as to hold water and allow infiltration around root ball. A minimum of 2 inches of cypress mulch shall be placed within the watering basin. Watering basins must be maintained and kept free of weeds during the entire maintenance period.

J. Insect and Disease Control: Apply treatment as frequently as required during construction and 90-day maintenance period to prevent damage to plant material. Use only chemicals specifically approved by TCEQ.

K. Pruning: All existing and new vegetation shall be pruned/trimmed by a certified ISA Arborist, as directed on site by Engineer.

3.3 CLEANUP AND PROTECTION

A. Remove debris from landscaped areas daily and sweep clean adjacent pavements, if soiled by landscape activities.

B. Provide temporary barriers or fences as required to protect landscaping from damage or theft until final acceptance.

3.4 CLOSE-OUT DOCUMENTS

A. As-Built Drawings: Submit "As-Built" drawings before project close-out showing the landscape layout, including revised plant material, and other installation information.

B. Warranty Letters: Submit warranty letters for trees / palms / shrubs / ground covers / amenities.

END OF SECTION

SECTION 329200 – LAWNS & HYDROMULCH

PART 1- GENERAL

1.01 SUMMARY

A. Section Includes: The establishment of a complete and uniform lawn including fine grading, sodding, and/or hydromulching.

1.03 QUALIFICATIONS

A. Lawn work to be performed by a single firm specializing in commercial landscape work with a minimum of five (5) years' experience on similar type projects. Owner to review qualifications and approve subcontractor prior to commencing work.

1.02 SUBMITTALS

A. Submittals shall be formatted in a three-ring binder (10 copies) with tabs identifying each section. Required submittal information for this section shall be included with the overall landscape submittal and shall be designated 'Section-20-Lawns/Fertilizer'. The following submittals are required for this section:

1. Product Data: Manufacturer's specifications and application instructions for fertilizer.

2. Certificates: Inspection certificate from Texas Department of Agriculture indicating sod has been found free of diseases, insects and larvae.

3. Certificates: Breakdown of seed types, percentages, and mixture composition.

4. Sod Delivery Tickets: One per truckload indicating sod species, nursery certification, date and time of cutting.

1.03 DELIVERY, STORAGE AND HANDLING

A. Sod Delivery: Have sod delivered within twenty-four hours of cutting. Stack sod with roots to roots, protected from exposure to elements during shipment.

B. Storage: Lay sod as soon a practicable after delivery. If installation is delayed more than four hours, store sod under shade and keep constantly moist. Sod must be laid within forty-eight hours of cutting. Do not pile more than two foot depth of sod. Do not tear, stretch or drop sod. Do not allow soil to break free of turf roots.

1.04 PROJECT CONDITIONS

A. Utility Construction. Do not lay sod or begin hydro-mulching until all underlying utility work is complete, trenches backfilled, compacted and graded, and topsoil place and fine grading.

1.05 MAINTENANCE/WARRANTY

A. Maintenance Service: Maintain the work of this Section until the Date of Substantial Completion and ninety (90) days thereafter or until a complete and uniform lawn has been established and final acceptance has been approved by Owner or Engineer.

1. Establish hydro-mulched or sodded lawns per planting plans. Reapply hydro-mulch or re-sod as necessary until full and uniform coverage is obtained.
2. Mow lawns to maintain height of grass at 2 inches or as directed by Owner or Engineer
3. Tim/edge all lawn areas adjacent to watering basins, pavements, driveways, walls, structures, curbs, planting beds, edges and island.
4. Provide weed, insect and disease control to maintain health of grass.
5. Fertilize with commercial grade lawn fertilizer until complete and uniform coverage is obtained.
6. Irrigation:
    a) If the irrigation system is operating, program and monitor the system to provide adequate water for grass.
    b) If the irrigation system is not operating, hand water grass.

B. Warranty: Warranty shall cover all lawn grasses for a period of three months from the date of substantial completion or until final acceptance by Owner. Final acceptance will not be approved until full and uniform lawns are completely established.

C. Maintenance Records: Contractor must provide Owner copies of all maintenance records including dates maintenance occurred, type of maintenance carried out, crew time on site and any issues such as problems with irrigation, etc.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Sod: (See schedule for type). Provide premium #1 certified sod grown in a sod nursery on sandy soil, at least 1 yr. old with a heavy top and a strong, well-knit root system, and not more than five percent weeds or foreign grasses.

B. Hydro-mulch mixture: (See schedule for type). Lawn seed mixture shall be shall be fresh, clean new, crop seed. Hydromulch mixture shall be composed of both hulled and unhulled seed with an appropriate percentage of Rye according to season of planting. The Contractor shall furnish the dealer's guaranteed statement of the composition of the mixture and the percentage of purity and germination of each variety for approval prior to beginning work. Any hydro-mulching applied before Engineers approval of the exact mixture will be subject to rejection and shall be re-done with approved mixture.

C. Fertilizer: 12-4-8 (N-P-K), formulated for slow-release Nitrogen.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine the site and conditions under which this work is to be performed. Have the installer notify the Contractor in writing, with a copy to the Engineer, if the site is unsatisfactory. Do not begin the work until unsatisfactory conditions have been corrected in a manner acceptable to installer. Beginning of work indicates acceptance of the site as satisfactory by the installer.

3.02 PREPARATION

A. Site Preparation: Contractors must visit and review site prior to bidding. Compacted soils and sub-soils from construction activities must be ripped and tilled until a loose, friable and free-draining condition is met. All existing weeds, grass, stabilized sub-base material, rubble, excavated soil and other material shall be removed from the site and disposed of by the contractor prior to starting any new landscape work. Soil conditions around entire site must be approved by the Engineer prior to rough and finished grading operations. Contractor shall not install any fill or topsoil in landscape areas prior to site condition approval by the Engineer.

3.03 INSTALLATION- HYDROMULCH/SEED

A. All exterior ground within the limit of contract, except surfaces occupied by structures and paving, except areas indicated to be undisturbed, shall be seeded, hydro-mulched or planted as shown on drawings. Furnish topsoil as required, finish grading, prepare seed bed, seed, hydro-mulch and maintain areas as indicated on the drawings.

B. Lawn Area Preparations - Grade areas to finish grades, filling as needed or removing surplus material. Float all lawn areas to a smooth, uniform grade as indicated on Civil Engineer's grading plans. All lawn areas shall slope to drain away from structures, sidewalks, driveways and planting beds. Where no grades are shown, areas shall have a smooth and continual grade between existing or fixed controls (such as walks, curbs, catch basins/drain inlets, elevational steps or structures) and elevations shown on plans. Contractor to ensure proper drainage away from all structures. Adjust grades as necessary to direct water away from structures and planting beds. Report any discrepancies on all drainage issues in writing to the Engineer, and Owner or Owner's Representative.

C. Roll, scarify, rake and level as necessary to obtain true, even lawn surfaces. All finish grades shall meet approval of the Engineer before seeding/hydro-mulching operations. Loosen soil to a depth of three inches (3”) in lawn areas by approved method of scarification and grade to remove edges and depressions. Remove stones or foreign matter over one half inch (1/2”) in diameter from the top three inches (3”) of soil

Float lawn areas to finish grades.

D. Lawn areas should be permitted to settle or should be firmed by rolling before seeding/hydromulching.

E. Seeding/hydro-mulching shall not be performed in windy weather.

F. Lawn areas shall be seeded by hydro-mulching evenly with an approved mechanical hydro-mulcher at the rate of a minimum of three (3) pounds per 1,000 square feet. In areas inaccessible to hydro-mulching equipment, the seeded ground shall be lightly raked with flexible rates and rolled with a water ballast roller. After rolling, seeded areas are to be lightly mulched with wheat straw or approved material.

G. Water seeded/hydro-mulched areas daily or as necessary to keep ground and hydro-mulch moist. Do not excessively water so as to cause erosion or ponding. Continue this watering regime until full germination. After germination period water lawn areas only as required to maintain health and vigor of grass growth. The surface layer of soil for seeded/hydromulched areas must be kept moist during the germination period. After first cutting, water as specified above.

H. Make daily inspections to determine the moisture content of the soil and adjust the watering schedule established by the irrigation system installer to fit conditions.

I. After grass growth has started, all areas or parts of areas, which fail to show a uniform stand of grass for any reason whatsoever shall be reseeded/hydro-mulched in accordance with the plans and as specified herein. Such areas and parts of areas shall be reseeded/hydro-mulched or sodded repeatedly until all areas are covered with a full and uniform stand of grass at no additional cost to the Owner.

J. Watering shall be done in such a manner and as frequently as is deemed necessary by the contractor or Owner to assure continued growth of healthy grass. All areas of the site shall be watered in such a way as to prevent erosion due to excessive

quantities applied over small areas and to avoid damage to the finished surface due to the watering equipment.

K. Water for the execution and maintenance of this work shall be provided by the Owner at no expense to the Contractor. The Contractor shall, however, furnish his own portable tanks, pumps, hose, pipe, connections, nozzles, and any other equipment required to transport the water from the available outlets and apply it to the lawn areas in an approved manner.

L. Mowing of the seeded, hydromulched or sodded areas shall be initiated when the grass has attained a height of three to four inches (3" to 4"). For subsequent mowing Bermuda grass shall be maintained at a height of 2" and St. Augustine grass shall be maintained at a height of 3". Not more than one third (1/3) of the grass leaf shall be removed at any cutting and cutting shall not occur more than seven (7) days apart.

M. When the amount of grass is heavy, it shall be removed to prevent destruction of the underlying turf. If weeds or other undesirable vegetation threaten to smother the planted species, such vegetation shall be mowed or, in the case of rank growths, shall be uprooted, raked and removed from the area by methods approved by Owner.

N. When the amount of grass is heavy, it shall be removed to prevent destruction of the underlying turf. If weeds or other undesirable vegetation threaten to smother the planted species, such vegetation shall be mowed or, in the case of rank growths, shall be uprooted, raked and removed from the area by methods approved by Owner.

O. Protect seeded/hydromulched areas against trespassing while the grass is germinating and growing-in. Furnish and install fences, signs, barriers or any other necessary temporary protective devices. Damage resulting from trespass, erosion, washout, settlement or other causes shall be repaired by the Contractor at their expense.

P. Remove all fences, signs, barriers or other temporary protective devices after final acceptance.

3.04 INSTALLATION-SOD

A. Sod shall be installed to all areas as indicated on plans.

B. Sod Bed Preparation - Grade areas to finish grade, filling as needed or removing surplus dirt, stone, debris, etc. and floating areas to a smooth, uniform grade as indicated on grading plans. All lawn areas are to slope to drain.

C. Sod shall be cut and laid on site the same day. Only healthy vigorous growing sod is to be laid.

D. Always lay sod across slope and tightly together so as to make a solid area.

E. Roll or firmly but lightly tamp with suitable wooded or metal tamper all new sod sufficiently to set or press sod into underlying soil.

F. Contractor to fill all gaps or seams in the sodded areas using clean sand.

G. After sodding has been completed, clean up and thoroughly water in newly sodded areas.

3.05 FERTILIZING- GRASS

A. Grass or sodded areas shall have fertilizer applied in two (2) applications with a thorough watering immediately following application. The first application shall be one (1) week before the hydro-seeding using a Starter Fertilizer 20-27-5 (N-P- K) at a rate of 3.5 lbs per 1,000 square feet and harrowed into the top two inches (2") of seedbed. The second application shall be done after grow-in using a Turf Builder fertilizer 12-4-8 (N-P-K) at the rate of 5 pounds per 1,000 square feet.

3.06 CLEANUP AND PROTECTION

A. Remove debris from landscaped areas daily and sweep clean adjacent pavements, if soiled by landscape activities.

B. Protect lawns from damage, theft or vandalism until final acceptance.

END OF SECTION

(Referenced from 2004 TxDOT, ITEM 164 Seeding for Erosion Control – references made to any other Sections of the 2004 TxDOT Manual shall become part of the Contract to be followed)

00164.1. Description. Provide and install temporary or permanent seeding for erosion control as shown on the plans or as directed.

00164.2. Materials.

A. Seed. Provide seed from the previous season's crop meeting the requirements of the Texas Seed Law, including the testing and labeling for pure live seed (PLS = Purity x Germination). Furnish seed of the designated species, in labeled unopened bags or containers to the Engineer before planting. Use within 12 mo. From the date of the analysis. When Buffalograss is specified, use seed that is treated with KNO3 (potassium nitrate) to overcome dormancy. Use Tables 1 through 4 to determine the appropriate seed mix and rates as specified on the plans.

Table 1
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils		Sandy Soils	
	Species and Rates (lb. PLS/ac.)		Species and Rates (lb. PLS/ac.)	
1 (Paris) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.2	Bermudagrass	1.5
	Bermudagrass	1.8	Bahiagrass (Pensacola)	6.0
	Little Bluestem (Native)	1.7	Sand Lovegrass	0.6
	Illinois Bundleflower	1.0	Weeping Lovegrass (Ermelo)	0.8
			Partridge Pea	1.0
2 (Ft. Worth) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	2.7	Sand Lovegrass	0.5
	Bermudagrass	0.9	Bermudagrass	1.8
	Little Bluestem (Native)	1.0	Weeping Lovegrass (Ermelo)	0.8
	Blue Grama (Hachita)	0.9	Sand Dropseed	0.4
	Illinois Bundleflower	1.0	Partridge Pearl	1.0
3 (Wichita Falls) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	2.7	Bermudagrass	1.2
	Bermudagrass	0.9	Sand Dropseed	0.4
	Buffalograss (Texoka)	1.6	Sand Bluestem	2.4
	Western Wheatgrass	2.1	Sand Lovegrass	0.3
	Blue Grama (Hachita)	0.6	Weeping Lovegrass (Ermelo)	0.6
	Illinois Bundleflower	1.0	Purple Prairieclover	0.5
4 (Amarillo) Feb. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Weeping Lovegrass (Ermelo)	0.8
	Blue Grama (Hachita)	1.2	Blue Grama (Hachita)	1.0
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.3
	Illinois Bundleflower	1.0	Sand Bluestem	1.8
			Purple Prairieclover	0.5
5 (Lubbock) Feb. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Weeping Lovegrass (Ermelo)	0.8
	Blue Grama (Hachita)	1.2	Blue Grama (Hachita)	1.0
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.3
	Illinois Bundleflower	1.0	Sand Bluestem	1.8
			Purple Prairieclover	0.5

Table 1 (continued)
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils Species and Rates (lb. PLS/ac.)		Sandy Soils Species and Rates (lb. PLS/ac.)	
6 (Odessa) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	2.3	Blue Grama	0.8
	Blue Grama (Hachita)	0.8	Sand Dropseed	0.4
	Alkali Sacaton	0.4	Weeping Lovegrass (Ermelo)	0.6
	Galleta	2.1	Indian Ricegrass	3.0
	Illinois Bundleflower	1.0	Purple Prairieclover	0.5
7 (San Angelo) Feb. 1 – May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	2.7	Sideoats Grama (Haskell)	2.7
	Buffalograss (Texoka)	1.6	Weeping Lovegrass (Ermelo)	0.6
	Little Bluestem (Native)	1.7	Sand Dropseed	0.4
	Blue Grama (Hachita)	0.9	Purple Prairieclover	0.5
	Galleta	1.6		
	Illinois Bundleflower	1.0		
8 (Abilene) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	2.7	Sand Bluestem	3.0
	Blue Grama (Hachita)	0.9	Weeping Lovegrass (Ermelo)	1.2
	Galleta	1.6	Sand Dropseed	0.5
	Buffalograss (Texoka)	1.6	Purple Prairieclover	0.5
	Little Bluestem (Native)	1.7		
	Illinois Bundleflower	1.0		
9 (Waco) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	1.2	Bermudagrass	2.4
	Sideoats Grama (Haskell)	3.6	Sand Dropseed	0.5
	Little Bluestem (Native)	2.0	Weeping Lovegrass (Ermelo)	0.8
	Illinois Bundleflower	1.0	Partridge Pea	1.0
10 (Tyler) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	1.8	Bermudagrass	1.8
	Bahiagrass (Pensacola)	9.0	Bahiagrass (Pensacola)	9.0
	Sideoats Grama (Haskell)	2.7	Weeping Lovegrass (Ermelo)	0.5
	Illinois Bundleflower	1.0	Sand Lovegrass	0.5
			Lance-Leaf Coreopsis	1.0

Table 1 (continued)
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils		Sandy Soils	
	Species and Rates (lb. PLS/ac.)		Species and Rates (lb. PLS/ac.)	
11 (Lufkin) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	1.8	Bermudagrass	2.1
	Bahiagrass (Pensacola)	9.0	Bahiagrass (Pensacola)	9.0
	Sideoats Grama (Haskell)	2.7	Sand Lovegrass	0.5
	Illinois Bundleflower	1.0	Lance-Leaf Coreopsis	1.0
12 (Houston) Jan. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.1	Bermudagrass	2.4
	Sideoats Grama (Haskell)	3.2	Bahiagrass (Pensacola)	10.5
	Little Bluestem (Native)	1.4	Weeping Lovegrass (Ermelo)	0.5
	Illinois Bundleflower	1.0	Lance-Leaf Coreopsis	1.0
13 (Yoakum) Jan. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Bermudagrass	1.8
	Bermudagrass	1.8	Bahiagrass (Pensacola)	6.0
	Little Bluestem (Native)	1.4	Sand Lovegrass	0.6
	Illinois Bundleflower	1.0	Weeping Lovegrass (Ermelo)	0.6
			Partridge Pea	1.0
14 (Austin) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	0.9	Bermudagrass	2.4
	Sideoats Grama (Haskell)	2.7	Weeping Lovegrass (Ermelo)	0.8
	Little Bluestem (Native)	1.0	Sand Lovegrass	0.8
	Blue Grama (Hachita)	0.9	Partridge Pea	1.0
	Illinois Bundleflower	1.0		
15 (San Antonio) Feb. 1 – May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	1.2	Bermudagrass	1.8
	Sideoats Grama (Haskell)	2.7	Lehmanns Lovegrass	0.6
	Little Bluestem (Native)	1.4	Sand Lovegrass	0.6
	Plains Bristlegrass	1.2	Buffelgrass (Common)	0.4
	Illinois Bundleflower	1.0	Partridge Pea	1.0
16 (Corpus Christi) Jan. 1 – May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	2.7	Bermudagrass	1.8
	Bermudagrass	1.8	Buffelgrass (Common)	0.4
	Buffalograss (Texoka)	1.6	Sand Lovegrass	0.6
	Plains Bristlegrass	1.2	Lehmanns Lovegrass	0.6
	Illinois Bundleflower	1.0	Purple Prairieclover	0.5

Table 1 (continued)
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils Species and Rates (lb. PLS/ac.)		Sandy Soils Species and Rates (lb. PLS/ac.)	
17 (Bryan) Feb. 1 – May 15	Green Sprangletop Bermudagrass Sideoats Grama (Haskell) Little Bluestem (Native) Illinois Bundleflower	0.3 1.5 3.6 1.7 1.0	Green Sprangletop Bermudagrass Bahiagrass (Pensacola) Weeping Lovegrass (Ermelo) Sand Lovegrass Lance-Leaf Coreopsis	0.3 1.5 7.5 0.6 0.6 1.0
18 (Dallas) Feb. 1 – May 15	Green Sprangletop Bermudagrass Sideoats Grama (El Reno) Little Bluestem (Native) Buffalograss (Texoka) Illinois Bundleflower	0.3 1.2 2.7 2.0 1.6 1.0	Green Sprangletop Bermudagrass Weeping Lovegrass (Ermelo) Sand Lovegrass Sand Dropseed Partridge Pea	0.3 1.8 0.6 0.6 0.4 1.0
19 (Atlanta) Feb. 1 – May 15	Green Sprangletop Bermudagrass Sideoats Grama (Haskell) Illinois Bundleflower	0.3 2.4 4.5 1.0	Green Sprangletop Bermudagrass Bahiagrass (Pensacola) Sand Lovegrass Lance-Leaf Coreopsis	0.3 2.1 7.5 0.6 1.0
20 (Beaumont) Jan. 15 – May 15	Green Sprangletop Bermudagrass Sideoats Grama (Haskell) Illinois Bundleflower	0.3 2.7 4.1 1.0	Green Sprangletop Bermudagrass Bahiagrass (Pensacola) Sand Lovegrass Lance-Leaf Coreopsis	0.3 2.1 7.5 0.6 1.0
21 (Pharr) Jan. 15 – May 15	Green Sprangletop Sideoats Grama (Haskell) Plains Bristlegrass Buffalograss (Texoka) Bermudagrass Illinois Bundleflower	0.3 3.6 1.2 1.6 1.2 1.0	Green Sprangletop Bermudagrass Buffelgrass (Common) Sand Dropseed Lehmanns Lovegrass Purple Prairieclover	0.3 1.8 0.4 0.4 0.6 0.5
22 (Laredo) Jan. 15 – May 1	Green Sprangletop Sideoats Grama (Haskell) Bermudagrass Buffalograss (Texoka) Plains Bristlegrass Illinois Bundleflower	0.3 3.6 1.2 1.6 1.2 1.0	Green Sprangletop Bermudagrass Buffelgrass (Common) Sand Dropseed Lehmanns Lovegrass Purple Prairieclover	0.3 1.8 0.4 0.4 0.6 0.5

Table 1 (continued)
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils		Sandy Soils	
	Species and Rates (lb. PLS/ac.)		Species and Rates (lb. PLS/ac.)	
23 (Brownwood) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	2.7	Bermudagrass	1.8
	Bermudagrass	0.6	Weeping Lovegrass (Ermelo)	0.6
	Blue Grama (Hachita)	0.9	Sand Lovegrass	0.6
	Galleta	2.1	Sand Dropseed	0.4
	Illinois Bundleflower	1.0	Purple Prairieclover	0.5
24 (El Paso) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Butte)	2.7	Sand Dropseed	0.4
	Blue Grama (Hachita)	0.9	Lehmanns Lovegrass	0.9
	Galleta	2.1	Blue Grama (Hachita)	1.0
	Alkali Sacaton	0.4	Indian Ricegrass	1.6
	Illinois Bundleflower	1.0	Purple Prairieclover	0.5
25 (Childress) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	2.7	Weeping Lovegrass (Ermelo)	1.2
	Blue Grama (Hachita)	0.9	Sand Dropseed	0.5
	Western Wheatgrass	2.1	Sand Lovegrass	0.8
	Galleta	1.6	Purple Prairieclover	0.5
	Illinois Bundleflower	1.0		

Table 2
Permanent Urban Seed Mix

District and Planting Dates	Clay Soils Species and Rates (lb. PLS/ac.)		Sandy Soils Species and Rates (lb. PLS/ac.)	
1 (Paris) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
2 (Ft. Worth) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Sideoats Grama (El Reno)	3.6
	Bermudagrass	2.4	Bermudagrass	2.1
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.3
3 (Wichita Falls) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	4.5	Sideoats Grama (El Reno)	3.6
	Bermudagrass	1.8	Bermudagrass	1.8
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.4
4 (Amarillo) Feb. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Sideoats Grama (El Reno)	2.7
	Blue Grama (Hachita)	1.2	Blue Grama (Hachita)	0.9
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.4
			Buffalograss (Texoka)	1.6
5 (Lubbock) Feb. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Sideoats Grama (El Reno)	2.7
	Blue Grama (Hachita)	1.2	Blue Grama (Hachita)	0.9
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.4
			Buffalograss (Texoka)	1.6
6 (Odessa) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Sideoats Grama (Haskell)	2.7
	Blue Grama (Hachita)	1.2	Sand Dropseed	0.4
	Buffalograss (Texoka)	1.6	Blue Grama (Hachita)	0.9
			Buffalograss (Texoka)	1.6
7 (San Angelo) Feb. 1 – May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	7.2	Sideoats Grama (Haskell)	3.2
	Buffalograss (Texoka)	1.6	Sand Dropseed	0.3
			Blue Grama (Hachita)	0.9
			Buffalograss (Texoka)	1.6

Table 2 (continued)
Permanent Urban Seed Mix

District and Planting Dates	Clay Soils Species and Rates (lb. PLS/ac.)		Sandy Soils Species and Rates (lb. PLS/ac.)	
8 (Abilene) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Sand Dropseed	0.3
	Blue Grama (Hachita)	1.2	Sideoats Grama (Haskell)	3.6
	Buffalograss (Texoka)	1.6	Blue Grama (Hachita)	0.8
			Buffalograss (Texoka)	1.6
9 (Waco) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	1.8	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6	Bermudagrass	3.6
	Sideoats Grama (Haskell)	4.5	Sand Dropseed	0.4
10 (Tyler) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
11 (Lufkin) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
12 (Houston) Jan. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	4.5	Bermudagrass	5.4
	Bermudagrass	2.4		
13 (Yoakum) Jan. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	4.5	Bermudagrass	5.4
	Bermudagrass	2.4		
14 (Austin) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	4.8
	Sideoats Grama (Haskell)	3.6	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6		
15 (San Antonio) Feb. 1 – May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Bermudagrass	4.8
	Bermudagrass	2.4	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6		
16 (Corpus Christi) Jan. 1 – May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Bermudagrass	4.8
	Bermudagrass	2.4	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6		

Table 2 (continued)
Permanent Urban Seed Mix

District and Planting Dates	Clay Soils Species and Rates (lb. PLS/ac.)		Sandy Soils Species and Rates (lb. PLS/ac.)	
17 (Bryan) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
18 (Dallas) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6	Bermudagrass	3.6
	Bermudagrass	2.4	Sand Dropseed	0.4
19 (Atlanta) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
20 (Beaumont) Jan. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Bermudagrass	2.4	Bermudagrass	5.4
	Sideoats Grama (Haskell)	4.5		
21 (Pharr) Jan. 15 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6	Bermudagrass	3.6
	Bermudagrass	2.4	Sand Dropseed	0.4
22 (Laredo) Jan. 15 – May 1	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	4.5	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6	Bermudagrass	3.6
	Bermudagrass	1.8	Sand Dropseed	0.4
23 (Brownwood) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	3.6	Buffalograss (Texoka)	1.6
	Bermudagrass	1.2	Bermudagrass	3.6
	Blue Grama (Hachita)	0.9	Sand Dropseed	0.4
24 (El Paso) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Butte)	3.6	Buffalograss (Texoka)	1.6
	Blue Grama (Hachita)	1.2	Sand Dropseed	0.4
	Buffalograss (Texoka)	1.6	Blue Grama (Hachita)	1.8
25 (Childress) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	3.6	Sand Dropseed	0.4
	Blue Grama (Hachita)	1.2	Buffalograss (Texoka)	1.6
	Buffalograss (Texoka)	1.6	Bermudagrass	1.8

Table 3
Temporary Cool Season Seeding

Districts	Dates	Seed Mix and Rates (lb./ac.)	
Paris (1), Amarillo (4), Lubbock (5), Dallas (18)	September 1 – November 30	Tall Fescue Western Wheatgrass Wheat (Red, Winter)	4.5 5.6 34
Odessa (6), San Angelo (7), El Paso (24)	September 1 – November 30	Western Wheatgrass Wheat (Red, Winter)	8.4 50
Waco (9), Tyler (10), Lufkin (11), Austin (14), San Antonio (15), Bryan (17), Atlanta (19)	September 1 – November 30	Tall Fescue Oats Wheat	4.5 24 34
Houston (12), Yoakum (13), Corpus Christi (16), Beaumont (20), Pharr (21), Laredo (22)	September 1 – November 30	Oats	72
Ft. Worth (2), Wichita Falls (3), Abilene (8), Brownwood (23), Childress (25)	September 1 – November 30	Tall Fescue Western Wheatgrass Cereal Rye	4.5 5.6 34

Table 4 Temporary Warm Season Seeding

Districts	Dates	Seed Mix and Rates (lb./ac.)	
All	May 1 August 31	Foxtail Millet	34

B. Fertilizer. Use fertilizer in conformance with Article 166.2, "Materials."

C. Vegetative Watering. Use water that is clean and free of industrial wastes and other substances harmful to the growth of vegetation.

D. Mulch.

1. **Straw or Hay Mulch.** Use straw or hay mulch in conformance with Article 162.2.E, "Mulch."
2. **Cellulose Fiber Mulch.** Use only cellulose fiber mulches that are on the approved list published in "Field Performance of Erosion Control Products," available from the Maintenance Division. Submit 1 full set of manufacturer's literature for the selected material. Keep mulch dry until applied. Do not use molded or rotted material.

E. Tacking Methods. Use a tacking agent applied in accordance with the manufacturer's recommendations or a crimping method on all straw or hay mulch operations. Tacking agents must be approved before use, or specified on the plans.

00164.3. Construction. Cultivate the area to a depth of 4 in. before placing the seed unless otherwise directed. When performing permanent seeding after an established temporary seeding, cultivate the seedbed to a depth of 4 in. or mow the area before placement of the permanent seed. Plant the seed specified and mulch, if required, after the area has been completed to lines and grades as shown on the plans.

A. Broadcast Seeding. Distribute the seed or seed mixture uniformly over the areas shown on the plans using hand or mechanical distribution or hydro-seeding on top of the soil. When seed and water are to be distributed as a slurry during hydro-seeding, apply the mixture to the area to be seeded within 30 min. of placement of components in the equipment. Roll the planted area with a light roller or other suitable equipment. Roll sloped areas along the contour of the slopes.

B. Straw or Hay Mulch Seeding. Plant seed according to Section 164.3.A, "Broadcast Seeding." Immediately after planting the seed or seed mixture, apply straw or hay mulch uniformly over the seeded area. Apply straw mulch at 2 to 2.5 tons per acre. Apply hay mulch at 1.5 to 2 tons per acre. Use a tacking method over the mulched area.

C. Cellulose Fiber Mulch Seeding. Plant seed according to Section 164.3.A, "Broadcast Seeding." Immediately after planting the seed or seed mixture, apply cellulose fiber mulch uniformly over the seeded area at the following rates:

- Sandy Soils with slopes of 3:1 or less—2500 lb. per acre.
- Sandy Soils with slopes greater than 3:1—3000 lb. per acre.
- Clay Soils with slopes of 3:1 or less—2000 lb. per acre.
- Clay Soils with slopes greater than 3:1—2300 lb. per acre. Cellulose fiber mulch rates are based on dry weight of mulch per acre.

Mix cellulose fiber mulch and water to make a slurry and apply uniformly over the seeded area using suitable equipment.

D. Drill Seeding. Plant seed or seed mixture uniformly over the area shown on the plans at a depth of 1/4 to 1/3 in. using a pasture or rangeland type drill. Plant seed along the contour of the slopes.

E. Straw or Hay Mulching. Apply straw or hay mulch uniformly over the area as indicated on the plans. Apply straw mulch at 2 to 2.5 tons per acre. Apply hay mulch at 1.5 to 2 tons per acre. Use a tacking method over the mulched area.

Apply fertilizer in conformance with Article 166.3, "Construction." Seed

and fertilizer may be distributed simultaneously during "Broadcast Seeding" operations, provided each component is applied at the specified rate. When temporary and permanent seeding are both specified for the same area, apply half of the required fertilizer during the temporary seeding operation and the other half during the permanent seeding operation.

Water the seeded areas at the rates and frequencies as shown on the plans or as directed.

00164.4. MEASUREMENT AND PAYMENT

A. When listed as a separate contract pay item, shall be measured in accordance with "Measurement and Basis of Payment" section or as shown on the Bid Proposal Form.

B. When not listed as a separate contract pay item, shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 330513 - FIBERGLASS MANHOLES

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

A. This work consist of materials for and the installation of manholes for sanitary sewer systems.

B. Manholes shall be constructed in accordance with the design and details shown on the plans and as hereinafter provided.

C. Invert elevations shall not vary more than 0.05 feet from the grade designated by the ENGINEER.

E. Manholes will not be constructed with cast in place steps. Where steps are required by the ENGINEER, the steps will be installed after the manhole has been constructed. The step used shall be a 1/2" grade 60 steel reinforcing rod in capsulated in a co-polymer polypropylene as manufactured by M.A. Industries, Inc. (Model #P-2-PFS) or equal as approved by the ENGINEER. Installation of the steps shall be as recommended by the manufacturer.

PART 2 - PRODUCTS

2.01 GENERAL:

A. All cement used shall by Type II Portland Cement.

B. All manhole foundations or bases shall be concrete and constructed as shown on the plans and in no case shall the thickness be less than 6 inches.

2.02 BRICK MANHOLES:

A. Unless otherwise specified, manholes described herein shall be constructed of grade MS Brick and Type M Concrete Mortar.

2.03 CONCRETE MANHOLES:

A. Precast Manholes & Sections

1. Construct eccentric or concentric top manholes as indicated of precast pipe on conformance with ASTM C-478 using Type II Portland Cement.
2. Provide factory block-outs at base or cast-in-place rubber gasket for connection of required sewer line.
3. Minimum wall thickness will be 1/2 inch.
4. Concrete in foundation shall comply with Section 03300 - Cast-in-Place Concrete.
5. Reinforcing steel shall comply with Section 03330 - Reinforcing Steel.

B. Cast-in-Place Manholes

1. Concrete shall comply with Section 03300 - Cast-in-Place Concrete.
2. Reinforcing Steel shall comply with Section 03330 - Reinforcing Steel.
3. Minimum wall thickness will be 5 inches.
4. Provide cast-in-place rubber gasket for connection of required sewer line.

C. Precast Concrete Manhole Bases

1. Precast concrete manhole bases may be used when approved by the ENGINEER. If approved, it shall be with the understanding that the CONTRACTOR shall be responsible for placing the bases at the specified elevation, location, and alignment.
2. Precast bases shall be manufactured with cast-in-place sewer pipe gaskets, such as: "A-LOK" or approved equal.

2.04 COATING OF MANHOLES:

A. Exterior of Manholes

1. If required, the coating shall be a waterproofing type of bitumastic or asphaltic material, as approved by the ENGINEER.
2. Application shall be in accordance with the manufacturer's published recommendations.

B. Interior of Manhole

1. If required, drain manhole coating shall be an epoxy type material conforming to Section 02590 - Polyurethane Protective Coatings.
2. All sanitary sewer manholes shall require two coating applications of Inertal Standard as manufactured by the Inertal Company, Inc. or equal as approved by ENGINEER.

C. Plastering of Manholes

1. The work shall include the coating of the surface of existing brick or block manholes with plaster as required on the plans or directed by the ENGINEER.

2.05 FRAMES, GRATES, RINGS AND COVERS:

A. Welded Steel

1. Welded steel grates and frames shall conform to the member, size, dimensions and details indicated and shall be welded into an assembly in accordance with those details.
2. Steel shall conform to the requirements of ASTM A 36.

B. Castings

1. Castings whether Gray Cast Iron or Ductile Iron shall conform to the shape and dimensions required and shall be clean substantial castings, free from sand or blowholes or other defects. Surfaces of the castings shall be free from burnt on sand and shall be reasonably smooth.
2. Runners, risers, fins and other cast on pieces shall be removed from the castings and such areas ground smooth.
3. Bearing surfaces between manhole rings and covers or grates and frames shall be cast or machined with such precision that uniform bearing shall be provided throughout the perimeter area of contact.
4. Pairs of machined castings shall be match marked to facilitate subsequent identification at installation.
5. Steel castings shall conform to ASTM A 27, "Mild to Medium Strength Carbon Steel Castings or General Application." Grade 70-36 shall be furnished unless otherwise specified.
6. Cast iron castings shall conform to ASTM A 48, "Gray Iron Castings," Class 30.
7. Ductile Iron castings shall conform to ASTM A 536, "Ductile Iron Castings." Grade 60-40-18 shall be used unless otherwise specified.

C. Rings

1. Adjusting rings shall conform to ASTM A 536, "Gray Iron Castings."

D. Nuts and Bolts

1. Commercial grade galvanized nuts and bolts shall be as indicated. The zinc coating shall be uniform in thickness, smooth, and continuous.

E. Mortar

Mortar for bedding castings shall consist of 1 part cement and 3 parts sand meeting the requirements of fine aggregate Grade No. 1 in Section 03300 - Cast-In-Place Concrete.

F. Manhole Accessories

1. Manhole lid and cover:

   a. Gray cast iron, with minimum clear opening 32-inches.
   b. Use Neenah R-1916-F or approved equal for bolted covers.
   c. Use Neenah R-1670-D or approved equal for lids not requiring bolting features.
   d. Provide anchor bolt holes for exposed manhole tops.
2. Manhole Rings - provide minimum of three throat rings between cone and manhole lid and cover.

PART 3 - EXECUTION

3.01 GENERAL:

A. Foundations shall be poured in place

B. Construct manhole foundation and channel inverts integrally. See Plan details.

C. Precast manhole sections may be installed after foundation concrete has attained 75% of design strength.

D. Forms for cast-in-place manhole may be installed after foundation concrete has attained 75% of design strength.

E. Manhole foundation and manhole may be installed simultaneously if manhole section is supported on concrete blocks and foundation concrete placed under and around bottom section.

F. Completely fill joints with pre-formed plastic gasket.

G. Heat materials in freezing weather and protect work from cold; maintain temperature of work at 40° F. for at least 24 hours after placing.

H. Invert Channels:

1. Form invert channel as required.
2. Make changes in direction of flow with smooth curves of as large a radius as size of manhole permits.
3. Make changes in size and grade smoothly and uniformly.
4. Slope floor of manhole adjacent to channel and drain thereto.
5. Finish channel bottom smoothly without roughness, irregularity, or pockets.

I. Pipe Connections:

1. Make watertight.
2. Use rubber gasket.
3. All connections shall be at flowline of manhole, unless otherwise required.

J. Exterior Pipe Support:

1. Support vitrified clay pipe on concrete cradle from manhole connection to first joint.
2. Provide first pipe joint within 18 inches of manhole wall.

K. Castings, frames, and fittings:

1. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is place.
2. The unit shall be protected until mortar or concrete is set.

L. Coatings shall be applied after ENGINEER's approval of structure.

M. Soil foundations, one foot beyond perimeter of concrete to base shall be compacted to a depth of one foot to 95% maximum density of ASTM D 1557.

3.02 BRICK MANHOLES:

A. Brick shall be clean, saturated surface dry before laying and shall be laid on a full mortar bed with "push joints."

B. In no event will shushing or grouting of a joint be permitted nor shall a joint be made by working in mortar after the brick has been laid.

C. Joints between the courses of bricks in manholes and other structures shall be as nearly as possible to a uniform thickness of 3/8 inch.

D. The inside and outside of all brick sewer structures shall be neatly plastered with Type M mortar 1/2 inch thick and cured.

E. Brick work shall not be laid upon a concrete foundation less than 24 hours after such foundation has been poured.

F. No brick work shall be laid in water nor, except as prescribed for curing, shall water be allowed to stand or run on any brick work until the mortar has thoroughly set.

G. Where new work is joined to existing unfinished work, the contact surfaces of the latter shall be thoroughly cleaned and moistened.

3.03 CONCRETE MANHOLES

A. Manholes constructed of poured concrete (reinforced or non-reinforced) or precast reinforced concrete risers and tops shall comply with the requirements of ASTM C 478.

B. Circular precast manhole sections shall be provided with a rubber or mastic gasket to seal joints between sections.

C. All lifting holes, except Type "C" manhole cover lids, and gaps at joints shall be filled with a non-shrink grout.

3.04 ABANDONMENT OF MANHOLES:

A. Abandonment of manhole, which is part of a sewer line being abandoned, shall entail the following work and materials.

1. Manhole will not be removed but will be abandoned in place.
2. All manhole inlet and outlet lines shall be plugged with a 12-inch long concrete mortar plug.
3. Salvageable material shall be stockpiled on the job site. The CONTRACTOR shall contact the OWNER to inspect the materials for usability. Salvageable materials shall be transported for usability.

Salvageable materials shall be transported by the CONTRACTOR to the OWNER'S storage yards. CONTRACTOR will receive a receipt for the turned-in materials. Receipts will be submitted to the ENGINEER prior to final acceptance of the Project.

4. Unusable material will be removed from the project site and properly disposed of by the CONTRACTOR.
5. Manhole bottom will be thoroughly pulverized, as directed by the ENGINEER.
6. The manhole shall be filled with cement treated base (CTB) material to the top of the proposed subgrade of the pavement or to the ground surface finished grade.
7. All labor, materials and equipment necessary to complete this work shall be furnished by the CONTRACTOR.

3.05 MANHOLE REHABILITATION IN REPLACEMENT WORK:

A. The work under this item shall be to replace the existing manhole frame and cover and to place a concrete pad around the existing manhole as required per the construction plans.

B. This work will be done when an existing manhole is encountered in the normal course of the replacement work that has a light weight, vented, multi-holed manhole cover.

C. This work shall include the following:

1. Remove any and all existing brick under frame and replace with new Grade MS brick as necessary to bring new frame and cover to street grade.
2. Remove and replace existing concrete pad, or construct a new pad around the collar.
3. Remove existing manhole steps and if manhole is greater than 10 feet deep, new steps will be installed.
4. Remove an repair pavement.
5. Excavation and compaction of backfill as required.
6. All materials, labor and equipment necessary to do the work under this item shall be furnished by the CONTRACTOR.

D. The work and materials under this item shall be done according to the manner set forth in the plan details and other sections of these specifications.

E. Salvageable material shall be stockpiled on the job site. The CONTRACTOR shall contact the OWNER to inspect the materials for usability. Salvageable materials shall be transported by the CONTRACTOR to the OWNER's Storage Yards. CONTRACTOR will receive a receipt for the turned-in materials. Receipts will be submitted to the ENGINEER prior to final acceptance of the Project. Unusable materials will be properly disposed of by the CONTRACTOR.

3.06 MANHOLE DATA SHEET:

A. Before this work is accepted, the CONTRACTOR shall provide to the ENGINEER a completed manhole data sheet for each new manhole constructed.

B. Manhole data sheet as shown in Exhibit 02575-1 will be completed in accordance with the following instructions:

1. A Manhole Data Sheet will be prepared for each manhole constructed.
2. The original copy of the Data Sheet will be filed with the ENGINEER. Distribution of copies will be made to all interested parties.
3. The Manhole Number will be assigned by the OWNER.
4. Manhole Type is the general description of the manhole, e.g.: 6 foot diameter Type C, or 4 foot diameter Type E as per plan details.
5. Manhole cover Size is the nominal diameter of the manhole cover. Type, Model and Pattern refers to the manufacturer, material made of, model number and design pattern to identify the identical manhole cover for replacement.
6. Section 3 requires the name of the CONTRACTOR, the name of the foreman, and the name of the inspector actually responsible for the construction of the manhole.
7. Under "Project Name" is the work order number under this contract.
8. Date Warranty Begins is the official date of acceptance of the Project or portion of the Project of which this manhole was a part.
9. Data Warranty expires is the expiration date under the Contract for requiring warranty repairs.
10. Street Location: Give both blocks number and street name. For manholes in intersections give both streets. The "Remarks" section may be used for further clarification of manhole location.
11. Disregard the section on coordinate location. To be filled in by the OWNER at a later date.
12. All applicable items on the Manhole Data Sheet should be filled in. However, accuracy is more important than filling in blank spaces. Therefore, if an item is unknown and cannot be determined, leave the space blank.

EXHIBIT 02575 - 1

MANHOLE DATA SHEET

SECTION 1

Manhole Number:

Manhole Type:

Date Installed:

Project Name:

SECTION 2

Manhole Cover Size:

Manhole Cover Type & Model:

Manhole Pattern:

Number of Rings Used:

SECTION 3

Contractor's Name:

Foreman's Name:

City Inspector's Name:

SECTION 4

Date Warranty Begins:

Date Warranty Expires:

SECTION 5

Street Location:

Intersection Location:

Remarks:

SECTION 6

Rim Elevation:

Invert Elevation:

SECTION 7 (To be completed by owner)

COORDINATE LOCATION

POINT	X (East) Departure	Y (North) Departure	Z Elevation
Center Manhole Invert:			
Center Manhole Cover:			
Electronic Marker Disc:			

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. New Manholes

1. Manholes of specified diameters with depths of 6 feet or less shall be measured per each.
2. Manholes of specified diameters with depths greater than 6 feet shall be measured per each. In addition, manholes for diameters specified shall be each measured per vertical linear foot of depth over 6 feet.
3. Measurements will be made to the nearest foot and will be from the manhole rim elevation to the manhole invert elevation.

B. Elevation Adjustments

1. When a new manhole is installed, no measurement or payment will be made for rim elevation adjustments to conform to proposed surface grades.
2. The following measurements for rim elevation adjustments on existing manholes will be made as follows:
   a. Adjustment to a manhole frame by the addition of adjustment rings (s) will be measured per each manhole adjusted.
   b. Leveling brick adjustment will be measured per each manhole adjusted.
   c. Adjustment of manhole cone or barrel will be measured by the manhole diameter per vertical foot.

C. Manhole Coating

1. If required, exterior coating of manholes will not be measured and will be considered incidental to the appropriate manhole.
2. Plastering of the interior of manholes will be measured per each manhole of specified diameter.
3. Polyurethane protective coatings will be measured as provided in Section 02590 - Polyurethane Protective Coatings.
4. Protective Inertial coatings for sanitary sewer manholes shall not be measured for payment.

D. Manhole Steps

1. If required, manhole steps will not be measured and will be considered incidental to the appropriate manhole.

E. Abandonment of Manholes

1. Abandonment of manholes will be measured per each for the work specified.

F. Manhole Rehabilitation

1. Manhole rehabilitation will be measured per each for the work specified.

4.02 PAYMENT:

A. New Manholes

1. Manholes of specified diameters with depths of 6 feet or less shall be paid for at the contract unit price per each manhole.
2. Manholes of specified diameters with depths greater than 6 feet shall be paid for at the contract unit price per each manhole as in 4.02 A.1 above. Additional payment shall be made at the contract unit price per each vertical linear foot of depth in excess of 6 feet for manholes of specified diameters.
3. Payment for manholes of any diameter and depth will include: excavation, compacted backfilling, shelving, cover or cone, leveling bricks, frame and cover, and concrete pad or collar.

B. Elevation Adjustments

1. The following payments for accepted quantities of rim elevation adjustments on existing manholes will be as follows:
   a. Adjustment of a manhole frame by addition of adjustment ring(s) will be paid for at the unit contract price per each manhole adjusted.
   b. Leveling brick adjustment will be paid for at the unit contract price per each manhole adjusted.
   c. Adjustment of manhole cone or barrel will be paid for at the unit contract price per manhole diameter per vertical foot.

C. Manhole Coating

1. If required, no direct payment shall be made for coating of the exterior of manholes and will be considered incidental to the appropriate manhole.
2. Plastering of the interior of manholes will be paid for at the unit contract price per manhole.
3. Polyurethane protective coatings will be paid for as provided in Section 02590 - Polyurethane Protective Coatings.

D. Manhole Steps

1. If required no direct payment shall be made for manhole steps, where required, and will be considered incidental to the appropriate manhole.

E. Payment for abandonment of manholes will be paid for at the unit price per each for the work specified.

F. Payment for manhole rehabilitation will be paid for at the unit price per each for the work specified.

G. If required, the following items will be included in the unit price per appropriate adjustment: pavement removal and repair, excavation, compacted backfill, concrete collar or pad, leveling bricks, adjusting rings, and frame and cover.

H. Compensation will be for furnishing all materials, labor, equipment, tools and incidentals required including polyurethane protective coating if not included as a separate pay item in this contract. All in accordance with the plans and specifications herein.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS SPECIFIED ELSEWHERE:

A. Trenching, Backfilling and Compacting: Section 02221.

B. Pipe Boring and Jacking: Section 02224.

C. Water Valves: Section 02558.

1.02 SUBMITTALS:

A. Conform to requirements of Section 01300 - Submittals.

B. Manufacturer's Literature: Manufacturer's descriptive literature and recommended method of installation.

C. Certificates: Manufacturer's certification that products meet specification requirements.

D. Submit shop drawings showing design of pipe and fittings indicating alignment and grade, laying dimensions, fabrication, fitting, flange, and special details. Show station numbers for pipe and fittings corresponding to Drawings. Production of pipe and fittings prior to review by City Engineer is at Contractor's risk.

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials on manufacturer's original skids or in original unopened protective packaging. OWNER reserves the right to reject material left from another job.

B. Store materials to prevent physical damage.

C. Protect materials during transportation and installation to avoid physical damage.

1.04 GENERAL DESCRIPTION OF WORK COVERED:

A. Furnish and install all pipe, fittings, structures and accessories required for water transmission line and/or pressure sewer lines.

1.05 QUALITY ASSURANCE:

A. Comply with the latest published edition of American Water Works Association (AWWA) Standards:

1. AWWA C110 & C110a - Gray Iron and Ductile-Iron Fittings, 2 inch through 48 inch for water and other liquids.
2. AWWA C111 - Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings.
3. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
4. AWWA C151 - Ductile-Iron Pipe, centrifugally cast in metal mold or sand lined molds, for water or other liquids.

5. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe 4 inch through 12 inch for water.
6. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe 14 inch through 48 inch for water.
6. AWWA C301-99 - Prestressed Concrete Pressure Pipe - Steel Cylinder Type, for water and other liquids.

B. Comply with the latest published editions of the American Society for Testing and Materials (ASTM) Standards:

1. D 2241 - Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR).
2. D 3139 - Joints for PVC Pressure Pipes using Flexible Elastomeric Seals.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS:

A. Pipe furnished may be either Polyvinyl Chloride (PVC), Steel Cylinder (SCP) or Ductile Iron (DI) as specified herein for water mains unless shown otherwise on the plans or bid documents.

B. Use PVC pipe for all pressure sewer lines unless shown otherwise on the plans.

C. All pipe shall be marked in accordance with the applicable standard specification under which the pipe is manufactured unless otherwise specified and shall be National Sanitation Foundation (NSF) approved stamped.

D. Steel cylinder pipe manufactured shall have had a successful experience record in the design and manufacture of steel cylinder pipe with substantial footage in successful operation for at least five years.

E. The quality of materials, the process of manufacture, and the finished pipe shall be subject to inspection and approval by the Engineer at the pipe manufacturing plant and at the project site prior to and during installation. All water distribution pipe and fittings shall be listed in the Fire Protection Equipment Directory published by the Underwriter's Laboratories, Inc. or shall be Factory Mutual approved for fire service.

2.02 POLYVINYL CHLORIDE PIPE (PVC):

A. Waterlines 12" and less may be constructed of PVC water pipe, pressure pipe, in accordance with AWWA standard C900 (latest version) for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4-inches through 12-inches, for Water Distribution. All pipe should be designed and installed with a minimum of four foot cover.

B. Waterlines 14 inches through 48 inches may be constructed of PVC water pipe, pressure pipe, in accordance with AWWA standard C905 (latest version) for PVC Water Transmission Pipe and Fabricated Fittings. All pipe should be designed and installed with a minimum of four foot cover.

C. Provide push-on joints with bell integrally cast into pipe or with coupling of same material as pipe.

D. Use elastomeric gaskets, as provided in AWWA C900 or ASTM D3139.

E. Provide either cast-iron or PVC 1120 fittings as indicated or required. Use long radius fittings where possible.

F. Provide fittings with materials and pressure class equal to or greater than that specified for pipe.

G. Provide sleeve type or anchored coupling where indicated or required to join pipe or provide restraint to offset internal or hydrostatic test pressures.

H. Provide pipe marked to indicate the following:

1. Nominal Pipe Size.
2. Material Code Designation.
3. Standard Dimension Ratio.
4. Pressure Rating.
5. Manufacturer's name or trademark.
6. National Sanitation Foundation Seal.
7. Appropriate ASTM designation number.

2.03 STEEL CYLINDER PIPE (SCP):

Provide pipe as specified in specification 02557 with a minimum working pressure of 200 psi or as shown on the plans or in the specifications.

2.04.1 DUCTILE IRON PIPE (DIP):

A. Pipelines ranging in size from 12 inches through 36 inches in diameter shall comply with the latest published edition of AWWA as modified herein:

1. AWWA C104/A21.4-95 - ANSI Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
2. AWWA C105/A21.5-93 - ANSI Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
3. AWWA C110-98 - ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3-inches through 48-inches (76 mm through 1,219 mm), for Water and Other Liquids
4. AWWA C111/A21.11-95 - ANSI Standard for Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
5. AWWA C115/A21.15-94 - ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
6. AWWA C150/A21.50-96 - ANSI Standard Thickness Design of Ductile-Iron Pipe
7. AWWA C151/A.21.51-96 - ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
8. ANSI B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
9. ASTM D 1248 - Polyethylene Plastics Molding and Extrusion Materials.
10. ASTM G 62 - Test Methods for Holiday Detection in Pipeline Coatings.
11. AWWA C 600 - Standard for Installation of Ductile Iron Water Mains and Their Appurtenances.
12. SSPC-SP 6 - Steel Structures Painting Council, Commercial Blast Cleaning.

B. Ductile-iron push-on and mechanical joint pipe shall meet all requirements of standard AWWA C151.

C. Joint Types include ANSI A21.11 push-on; ANSI A21.11 mechanical joint; or ANSI A21.15 flanged end. Provide push-on joints unless otherwise indicated on the Drawings or required by these specifications. For bolted joints, bolts shall conform to requirements of

AWWA C111. Threaded- or grooved-type joints which reduce pipe wall thickness below minimum required are not acceptable.

D. Provide manufacturer's certifications that all ductile iron pipe and fittings meet provisions of this Section and have been hydrostatically tested at factory and meet requirements of ANSI A21.51.

E. Provide certifications that all pipe joints have been tested and meet requirements of ANSI A21.11.

F. Ductile-iron flanged pipe shall meet all requirements of standard AWWA C115. Barrels shall have a nominal thickness required by Table 1 of AWWA C115, which thickness corresponds to Special Class 53 in sizes through 54-inch, and Class 350 in 60 and 64 inch sizes. Flanges shall be ductile-iron (gray-iron is not acceptable) they shall be Class 125 flanges as shown in ANSI/ASME B16.1; and shall conform to dimensions shown in Table 2 and Figure 1 of AWWA C115. Flanges shall be fabricated and attached to the pipe barrels by U.S. fabricators using flanges and pipe barrels of U.S. manufacture. If fabrication is to be by other than the pipe barrel manufacturer, a complete product submittal and approval by the Water and Wastewater Utility will be required. Additionally, such fabricator shall furnish certification that each fabricated joint has been satisfactorily tested hydrostatically at a minimum pressure of 300 psi.

G. Where ductile iron water main is cathodically protected from corrosion, bond rubber gasketed joints as shown on Drawings to provide electrical continuity along entire pipeline, except where insulating flanges are required by Drawings. Do not use polyethylene wrap with a cathodic protection system.

H. Where restrained joints for buried service are required by Drawings, provide one of the following, or equal:

1. Super-Lock Joint by Clow Corporation.
2. Flex-Ring or Lok-Ring by American Cast Iron Pipe Company.
3. TR-Flex Joint by U.S. Pipe and Foundry Company.

Provide for restrained joints designed to meet test pressures required under Part 3.04 of this section.

I. Linings and Coating: Interior surfaces of all ductile-iron water pipe shall be cement-mortar lined and seal coated as required by AWWA C104. Pipe exteriors shall be coated as required by the applicable pipe specification. The type and brand of interior lining shall be clearly marked on the outside of the pipe and fittings. Except as authorized by the E/A, only one type and brand of pipe lining shall be used on a given project.

J. Exterior: Prime coat and outside asphaltic coating conforming to ANSI A 21.10, ANSI A 21.15, or ANSI A 21.51 for pipe and fittings in open cut excavation and in casings. Pipe to be installed in potentially contaminated areas shall have coatings and linings recommended by the manufacturer as resistant to the contaminants identified.

K. Except as described above for flanged pipe (Thickness Class 53) and where not otherwise indicated, ductile-iron pipe shall be minimum Pressure Class 250 as defined by ANSI/AWWA C150/A21.50-current; all ductile-iron pipe and flanges shall meet the following minimum physical requirements:

Grade 60-42-10:
Minimum tensile strength: 60,000 psi (414 MPa)
Minimum yield strength: 42,000 psi (290 MPa)
Minimum elongation: 10 percent

L. The flanges for AWWA C115 pipe may also be made from:

Grade 70-50-05:
Minimum tensile strength: 70,000 psi (483 MPa)
Minimum yield strength: 50,000 psi (345 MPa)
Minimum elongation: 5 percent

L. Joint Materials:

1. Gaskets for mechanical joints shall conform to ANSI/AWWA A21.11/C-111.
2. Furnish, when no contaminant is identified, plain rubber (SBR) gasket material; for flanged joints 1/8-inch-thick gasket in accordance with ANSI A 21.15.
3. Pipes to be installed in potentially contaminated areas, especially where free product is found near the elevation of the proposed pipeline, shall have the following gasket materials for the noted contaminants:

Contaminant	**Gasket Material Required**
Petroleum (diesel, gasoline)	Nitrile Rubber
Other contaminants	As recommended by the pipe manufacture

4. Joining of slip joint iron pipe shall, without exception, be accomplished with the natural or synthetic rubber gaskets of the manufacturer of that particular pipe being used. A joint lubricant shall be used and applicable recommendations of the manufacturer shall be followed.
5. Gaskets for flanged joints shall be continuous full face gaskets, of 1/8 inch minimum thickness of natural or synthetic rubber, cloth reinforced rubber or neoprene material, preferably of deformed cross section deign and shall meet all applicable requirements of ANSI/AWWA A21.11/C-111 for gaskets. They shall be manufactured by, or satisfy all recommendations of, the manufacturer of the pipe/fittings being used and be fabricated for use with Class 125 ANSI B16.1 flanges.
6. Tee-head bolts, nuts, and washers for mechanical joints shall be high strength, low alloy, corrosion resistant steel stock equal to "COR-TEN A" having UNC Class 2 rolled threads or alloyed ductile-iron conforming to ASTM A 536; either shall be fabricated in accordance with ASTM B18.2 with UNC Class 2 rolled threads.
7. Hex-head bolts and nuts shall satisfy the chemical and mechanical requirements of ASTM A449 SAE Grade 5 plain, and shall be fabricated in accordance with ASTM B 18.2 with UNC Class 2 rolled threads.
8. Either Tee-head or Hex-head bolts, nuts, and washers as required, shall be protected with bonded fluoropolymer corrosion resistant coating where specifically required by the E/A.
9. All threaded fasteners shall be marked with a readily visible symbol cast, forged or stamped on each nut and bolt, which will identify the fastener material and grade. The producer and the supplier shall provide adequate literature to facilitate such identification; painted markings are not acceptable.

M. Polyethylene Film Wrap:

1. All iron pipe, fittings, and accessories including polyurethane coated pipe shall be wrapped with standard 8-mil (minimum) low density polyethylene film or r-fill (minimum) cross laminated high-density polyethylene conforming to AWWA C105, with all edges overlapped and taped securely with duct tape to provide a continuous wrap to prevent contact between the piping and the surrounding backfill. Repair all punctures of the polyethylene,

including those caused in the placement of bedding aggregates, with duct tape to restore the continuous protective wrap before backfilling.

2. For flanged joints in buried service, provide petrolatum wrapping system, Denso, or equal, for the complete joint and alloy steel fasteners. Alternatively, provide bolts made of Type 304 stainless steel.

0. Fittings. Each pipe joint and fitting shall be marked as required by the applicable AWWA specification. This includes in all cases: Manufacturer's identification, Country where cast, year of casting, and "DUCTILE" or "DI". Barrels of flanged pipe shall show thickness class; others shall show pressure class. The flanges of pipe sections shall be stamped with the fabricators identification; fittings shall show pressure rating, the nominal diameter of openings and the number of degrees for bends. Painted markings are not acceptable.

   1. Use fittings of same size as pipe. Reducers are not permitted to facilitate an off-size fitting. Reducing bushings are also prohibited. Make reductions in piping size by reducing fittings. Line and coat fittings as specified for pipe they serve.
   2. Push-on Fittings: ANSI A 21.10; ductile iron ANSI A 21.11 joints, gaskets, and lubricants; pressure rated at 250 psig.
   3. Flanged Fittings: ANSI A 21.10; ANSI B 16.1 cast or ductile iron. Flanges: ANSI B 16.1, Class 125; pressure rated at 250 psig.
   4. Mechanical Joint Fittings: ANSI A 21.11 (AWWA C110); pressure rated at 250 psi.

2.05 DUCTILE IRON PIPE FITTINGS:

A. Fittings shall be push-on, flanged, or mechanical joint as indicated or approved, with pressure rating of not less than that specified for adjacent pipe and shall meet all requirements of standards as follows:

   Sizes 4-inch and larger: AWWA C110

B. Shall be compatible with joint type of adjacent pipe.

C. All specials, taps, plugs, flanges and wall fittings shall be as required.

D. Interior surfaces of all iron water pipe fittings shall be lined with cement-mortar and seal coated as required by AWWA C104. Interior surfaces of all iron wastewater and force main fittings shall be coated with a non-corrosive lining material acceptable to Owner.

E. Fitting exteriors shall be coated as required by the applicable pipe specifications.

2.06 VALVES, HYDRANTS, METERS AND APPURTENANCES:

A. For valve requirements refer to Section 02558 (Water Valves).

B. Valve Boxes:

   1. Provide for all buried valves.
   2. Use nominal 6 inch cast-iron sliding type pipe shaft with cover and base casting.
   3. Set box top at finished grade.
   4. Furnish drop cover appropriately marked "WATER".

C. Corporation Stops:

   1. Conform with AWWA C800.
   2. Use 3/4 inch unless indicated otherwise.

D. Hydrants:

1. Design: latest edition of AWWA C502, traffic model with break flange.
2. Mueller Centrurion - A423
   a. American-Darling - B-84-B
   b. Kennedy Guardian - K-81A
   c. U.S. Pipe - Metropolitan
   d. Others as approved by OWNER in writing
3. Provide 6 inch inlet, 2 - 2> inch hose nozzles, 1 - 4> inch pumper.
4. Provide compression type main valve, minimum size 5< inches.
5. Pentagon operating nut.
6. Design to open counterclockwise.
7. Provide mechanical joint bell on footpiece.
8. Furnish depth as noted on plans.
9. Furnish National (American) Standard Fire Hose Coupling Screw Thread (NH).

E. Polyethylene Wrapping:

1. Material: AWWA C105.
2. Thickness: 8 mils.

F. Polyethylene Plastic Pipe (PE):

1. Material: ASTM D2737.
2. Fittings: ASTM D2683.
3. Size: 3/4 inch unless shown otherwise on plans.

G. Copper Pipe (CU):

1. Material: seamless, Type K, ATM B88.
2. Fittings: wrought copper solder joint or flared.
3. Size: 3/4 inch unless shown otherwise on plans.

PART 3 - EXECUTION

3.01 GENERAL:

A. Provide all labor, equipment and materials and install all pipe fittings, special and appurtenances as indicated or specified.

3.02 PIPE INSTALLATION:

A. Handling:

1. Handle in a manner to insure installation in sound and undamaged condition.
   a. Do not drop or bump.
   b. Use slings, lifting lugs, hooks and other devices designed to protect pipe, joint elements, and coatings.
2. Ship, move and store with provisions to prevent movement or shock contact with adjacent units.
3. Handle with equipment capable of work with adequate factor of safety against overturning or other unsafe procedures.

B. Installation:

1. Utilize equipment, methods, and materials insuring installation to lines and grades as

indicated.

a. Do not lay on blocks unless pipe is to receive total concrete encasement.

C. Accomplish horizontal and vertical curve alignments of ductile iron pipe with bends, bevels or deflection joints.

1. Limit joint deflection with ductile iron pipe to conform with AWWA C600.
2. Use short specials preceding curves as required.
3. Obtain approval of ENGINEER of method proposed or transfer of line and grade from control to the work.
4. Install pipe of size, material, strength class, and joint type with embedment as shown on plans or specified herein.
5. Clean interior of all pipe, fittings, and joints prior to installation. Exclude entrance of foreign matter during discontinuance of installation.
   a. Close open ends of pipe with snug fitting closures.
   b. Do not let water fill trench. Include provisions to prevent flotation should water control measures prove inadequate.
   c. Remove water, sand, mud and usher undesirable materials from trench before removal of end cap.
6. Pipe shall be inspected prior to installation to determine if any pipe defects are present.
7. Brace or anchor as required to prevent displacement after establishing final position.
8. Perform only when weather and trench conditions are suitable.

a. Do not lay in water.

9. Observe extra precaution when hazardous atmospheres might be encountered.
10. Sanitary sewer relation to water mains:
    a. Maintain 9 feet horizontal separation whenever possible.
    b. When conditions prevent a lateral separation of 9 feet, sewer may be installed closer to a water main if:
       (1) sewer constructed of PVC pipe meeting AWWA Specifications and having a minimum working pressure rating of 150 psi or greater and equipped with pressure type joints, and
       (2) the sewer line and water main are separated by a minimum vertical distance of 2 feet and a minimum horizontal distance of 4 feet, measured between the nearest outside diameters of the pipes.
    c. When a sanitary sewer crosses a water line and that portion of the sewer is constructed as described is 3.02 B.9.b.(1), the sewer may be placed no closer than 6 inches from the water line. The separation distance must be measured between the nearest outside pipe diameters. The sewer line shall be located at a lower elevation than the water line whenever possible and one length of the sewer pipe must be centered on the water line.
11. Separation of water mains from sewer manholes:
    a. No water pipe shall pass through or come in contract with any part of a sewer manhole.
    b. A minimum horizontal separation of 9 feet shall be maintained.
12. Construct service lines where shown on plans in accordance with Standard Detail Drawing. Use pipe material specified on plans or in contract documents.
13. Wrap pipe, fittings and tie rods with polyethylene where shown on plans in accordance with AWWA C105.

D. Jointing:

1. General requirements:

   a. Locate joint to provide for differential movement at changes in type of pipe embedment, at changes from rock to soil trench bottom, and structures.
      (1) Not more than 18 inches from structure wall, or
      (2) Support pipe from wall to first joint with concrete cradle structurally continuous with

base slab or footing of structure.
   b. Perform in accordance with manufacturer's recommendations.
   c. Clean and lubricate all joint and gasket surfaces with lubricant recommended.
   d. Utilize methods and equipment capable of fully homing or making up joints without damage.
   e. Check joint opening and deflection for specification limits.
2. Special provisions for jointing cast-iron and ductile iron:
   a. Conform to AWWA C600.
   b. Visually examine while suspended and before lowering into trench.
      (1) Paint bell, spigot, or other suspected portions with turpentine and dust with cement to check for cracks invisible to the eye.
      (2) Remove turpentine and cement by washing when test is satisfactorily completed.
      (3) Reject all defective pipe.
3. Special provisions for jointing and laying PVC pipe:
   a. Conform to AWWA C600 and ASTM D2321.
   b. Allow pipe to reach trench soil temperature prior to installation in ditch.
4. Special provisions for jointing steel cylinder pipe:
   a. Before laying each joint, the bell and spigot rings shall be cleaned by wire brush and wiped clean and dry.
   b. Inside cement mortar joint:
      (1) the inside joint recess shall be filled immediately prior to placing the pipe together by buttering the bell end with mortar.
      (2) the joint mortar of pipe 18 inch diameter and smaller shall be smoothed and cleaned with a swab.
      (3) the joint mortar of pipe diameters larger than 18 inches shall be finished off smooth by hand trowel.
   c. Outside cement mortar joint:
      (1) encircle joint with wrapper after joint found satisfactory.
      (2) leave enough space between wrapper ends to allow cement mortar to be poured.
      (3) the entire joint shall be poured with cement mortar and consolidated and rodded or agitated to eliminate voids.

E. Cutting:

1. Cut in neat workmanlike manner without damage to pipe.
2. Cut cast-iron with Carborumdum saw or other approved method.
   a. Smooth cut by power grinding to remove burrs and sharp edges.
   b. Repair lining as required and approved by ENGINEER.

F. Closure Pieces:

1. Connect two segments of pipelines or a pipeline segment and existing structure with short sections of pipe fabricated for the purpose.
2. Observe specifications regarding location of joints, type of joints and pipe materials and strength classifications.
3. May be accomplished with sleeve coupling for water pipe:
   a. Of length such that gaskets are not less than 3 inches from pipe ends.
   b. Include spacer ring identical to pipe end such that clear space does not exceed 1/4 inch.

G. Temporary Plugs:

1. Install whenever installed pipe is left unattended.
2. Use water-tight plug.

H. Thrust Blocks:

1. Provide for all horizontal or vertical turns utilizing fittings.
2. Use on all dead-end and tee fittings.
3. Install as indicated on Standard Detail Drawing
4. Construct to undisturbed edge of trench for bearing.
5. Provide minimum bearing area in S.F. as follows based on 150 psi test pressure and 2000 psf soil bearing: Pipe Tee/ 11<0 22>0 45^{O} 90^{O}

Size	Deadends	Bend	Bend	Bend	Bend
4"	1.0	0.5	0.5	0.8	1.3
6"	2.2	0.5	0.9	1.6	3.0
8"	3.8	0.8	1.5	2.9	5.3
10"	6.0	1.2	2.3	4.5	8.4
12"	8.5	1.7	3.3	6.5	12.1
14"	11.6	2.3	4.5	8.9	16.4
16"	15.2	3.0	5.9	11.6	21.4

3.03 VALVE AND APPURTENANCE INSTALLATION:

A. Valves:

1. Install with stems vertical when installation is horizontal.
2. Set valves on concrete thrust block having four (4) square feet of bearing area on undisturbed earth.

B. Valve Boxes:

1. Center on valves.
2. Carefully tamp earth around each valve box to a distance of 4 feet on all sides of box or to undisturbed trench face, if less than 4 feet.

C. Hydrants:

1. Set hydrants where shown on plans in accordance with Standard Detail Drawing.
2. Install gravel, blocks and anchors in accordance with Standard Detail Drawing.
3. Set reference elevation 3 inches above existing grade or to elevation established by ENGINEER (not to exceed 6 inches).
4. Break-a-way flange to be either ground level where applicable or between 3 inches and 6 inches above curb as established by ENGINEER.

3.04 ACCEPTANCE TESTS FOR PRESSURE MAINS:

A. Perform hydrostatic pressure and leakage test.

1. Conform to AWWA C600 procedures.
   a. As modified herein.
   b. Shall apply to all pipe materials specified.
2. Perform after backfilling.

B. Test separately in segments between sectionalizing valves, between a sectionalizing valve and a test plug, or between test plugs.

1. CONTRACTOR to furnish and install test plugs, including all anchors, braces and other temporary or permanent devices to withstand hydrostatic pressure on plugs, at no additional cost to the OWNER.

2. CONTRACTOR responsible for any damage to public or private property caused by failure of plugs.

C. Limit fill rate of line to available venting capacity. Fill rate shall be regulated to limit velocity in lines when flowing full to not more than 1 fps.

D. OWNER will make water for testing available to contractor at nearest source. Valves of existing system will at all times be operated by City personnel only.

E. Pressure test:

1. Conduct at pressure at least 1.5 times than normal working pressure (not less than 150 psi test pressure).
2. Maintain pressure for a minimum of two (2) hours.
3. Test pressure shall not vary by more than +5 psi

F. Leakage Test:

1. Conduct concurrently with the pressure test.
2. Maintain pressure for a minimum of two (2) hours.
3. Acceptable when leakage does not exceed that determined by the following formula:

$$L = \frac{ND(P)^{1/2}}{7400}$$

L = Maximum permissible leakage in gallons per hour.
N = Number of pipe joints in segment under test.
D = Nominal internal diameter of pipe being tested in inches.
P = Average actual leakage test pressure, psig.

4. Repeat leakage test as necessary.
   a. After location of leaks and repair or replacement of defective joints, pipe or fittings.
   b. Until satisfactory performance of test.
   c. At no increase in cost to the OWNER.

G. Refit and replace all pipe not meeting the leakage or pressure requirements. Repair clamp is not permitted.

H. Repair all visible leaks regardless of the amount of leakage.

I. OWNER or ENGINEER will observe all tests.

3.05 DISINFECTION OF PIPELINES FOR CONVEYING POTABLE WATER:

A. CONTRACTOR provide all equipment and materials and perform in accordance with AWWA C601.

1. As modified herein.
2. Include chlorination and final flushing.

B. Add chlorine to attain an initial concentration of 50 mg/l chlorine with 10 mg/l remaining after 24 hours.

C. Flush main until concentration is 2 mg/l or less prior to placing main in service.

D. Obtain approval of materials and methods proposed for use.
E. May be conducted in conjunction with acceptance tests.

F. Dispose of flushing water without damage to public or private property.

G. Repeat disinfection procedure should initial treatment fail to yield satisfactory results.
   1. At no additional cost to the OWNER.
   2. OWNER will provide water under terms specified for acceptance tests.

H. Do not exceed 500 gpm rate in flushing.

I. Provide safe bacterial sample results before placing main into service.

PART 4 - MEASUREMENT AND PAYMENT

4.01 PRESSURE LINES:

A. Line shall be measured along the center of the pipe without considering fittings or other pipe connections. The line will be paid at the contract bid price per linear feet.

B. Compensation will be for furnishing all materials, labor, equipment, tools and incidental work required by the construction of the pressure line, all in accordance with the plans and these specifications.

C. If pressure line fails any test procedure, trouble spot is to be corrected all as incidental to the construction of the pressure line.

END OF SECTION

SECTION 334100 – STORM SEWER STRUCTURES

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

A. This work shall consist of furnishing and installing appurtenances except manholes, for storm sewers in accordance with details on the plans, as specified herein, and as directed by the ENGINEER.

B. The various types of structures such as inlets, headwalls, energy dissipaters, etc. are designated on the plans by letters or by numbers indicating the particular design of each. Each type shall be constructed in accordance with the details indicated and to the depth required by the profiles and schedules given.

PART 2 - PRODUCTS

2.01 GENERAL:

A. The construction plans will specify the size and material for the pipe between the storm sewer main and structure.

B. The various types of storm inlets and their relation to curb and gutter, or valley gutter, are shown on the plan details. Construction plans will identify the type to be constructed.

C. Grating size, material, and configuration shall conform to the plan details.

2.02 MATERIALS:

A. Concrete
   1. Concrete for cast-in-place structures shall be Class A concrete.
   2. Concrete for precast structures shall be 4000 psi at 28 days and comply with the applicable requirements of ASTM C 478.

B. Mortar:
   1. Mortar shall be composed of 1 part Portland Cement and 2 parts clean, sharp mortar sand suitably graded for the purpose by conforming in other respects to the provisions of Section 03300 - Cast In Place Concrete for fine aggregate.

2. Hydrated lime or lime putty may be added to the mix, but in no case shall it exceed 10 percent by weight of the total dry mix.

C. Brick:

1. Bricks shall be of first quality, sound, hard-burned brick. Shale bricks, if used, shall be homogeneous, thoroughly and uniformly burned.
2. Bricks shall not absorb more than 17 percent of water by weight submerged in water for 24 hours, having been in a completely dry state prior to placing in water.
3. Clay brick shall conform to the requirements of ASTM C 62, Grade SW. Concrete brick meeting the requirements of ASTM C 55, Grade A, shall be acceptable.

D. Concrete Block: Concrete blocks shall conform to ASTM C 139.

E. Miscellaneous Items:

Cast iron for supports, steps and inlet units shall conform to the shape and dimensions indicated. The casting shall be clean and perfect, free from sand or blow holes or other defects. Cast iron casting shall meet the requirements of ASTM A 48, Class 30. Steel for temporary covers when used with Stage Construction shall be adequate for the trench loads imposed.

PART 3 - EXECUTION

3.01 INSTALLATION OF DRAINAGE FACILITIES:

A. Excavation and backfilling for the storm inlet shall be accomplished in accordance with Section 02218.

B. Trenching, backfilling, and compaction for the connecting pipe between the storm sewer main and the storm inlet shall conform to the specifications contained in Section 02221 - Trench Excavation and Compaction. Pipe shall be installed in accordance with Section 02571 - Sanitary and Storm Sewers.

C. All pipe and structures shall be installed per location and elevations, as shown on the construction plans. If an underground obstruction is encountered during installation (i.e., existing utility line), the work shall stop and the ENGINEER shall be immediately notified.

D. Direct connection to a storm sewer main will be permitted if:

(I.D.)	Connecting Line Not more than 12" (I.D.)	Sewer Main Not less than 36"
(I.D.)	Not more than 18" (I.D.)	Not less than 48"

For connecting lines sized greater than those specified above, the connection to the main will be made with a manhole or a factory constructed wye. Connection to the main will comply with the plan details.

E. Removal of curb and gutter, and sidewalk for installation of a storm inlet shall be made at a scored or full depth joint.

F. No width greater than 1/2 inch will be permitted between the inlet grate and the inlet frame.

G. Private drainage facility installations, which are to be constructed under an authorization of "Drainage Facilities within Public Right-of-Way," shall comply with the standard details and specifications.

H. The construction of inlets shall be completed as soon as is practical after storm sewer lines are connected to the inlet. All storm sewers shall be cut neatly at the inside face of the walls of the inlet and pointed up with mortar.

I. Bases for cast-in-place inlets may be placed prior to or at the CONTRACTOR'S option after the sewer is constructed.

J. The inverts passing out of or through an inlet shall be shaped and grouted across the floor of the inlet as indicated. This shaping may be accomplished by adding shaping mortar or concrete after the base is cast or by placing the required additional shaping material with the base.

K. All miscellaneous storm sewer structures shall be completed in accordance with the plan details. Backfilling to original ground elevation shall be in accordance with the provisions of the appropriate items and as directed by the ENGINEER.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. Pavement removal and repair will be measured by the square yard.

B. Trench excavation, backfill, and compaction will not be measured nor paid, but will be considered incidental work to the appropriate items.

C. Frame, grates, rings and covers will not be measured or paid, but will be considered incidental work to the appropriate items.

D. Storm sewer inlets shall be measured per each for the type and size specified.

E. All miscellaneous storm sewer structures satisfactorily completed in accordance with the plans and specifications will be measured per each complete unit.

4.02 PAYMENT:

A. The accepted quantities of pavement removal and repair shall be paid for at the contract unit price per square yard per type of repair.

B. The accepted quantities of storm inlets will be paid at the contract unit price per each per type of storm inlet, and shall include: the contract structure, grating, excavation, backfilling and compaction, and curb removal and replacement.

C. The accepted quantities of complete special storm sewer structures shall be paid at the unit price per each.

D. Compensation, whether by contract pay item or incidental work, will be for furnishing all material, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 334110- SITE DRAINAGE

PART I - GENERAL

1.01 RELATED DOCUMENTS

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply

1.02 WORK INCLUDED

A. Provide and install storm sewer piping, collection boxes, grates, manholes, culverts, inlets and headwalls as indicated in the Architectural drawings and specified herein.

B. Related trenching, pipe bedding, backfill, and compaction as indicated in the Civil and MEP documents drawings and specified herein.

C. Trench safety in accordance with OSHA requirements and as specified **under Trench Safety Section**.

1.03 QUALITY ASSURANCE

A. Piping indicated on plumbing drawings.

B. Site clearing, grading and filling.

1.04 SUBMITTALS

A. PRODUCT DATA: Submit manufacturer's literature for piping recast drainage structures and grates illustrating performance, fabrication procedures, materials and sizes.

PART 2 - PRODUCTS

2.01 MATERIALS

A. CONCRETE SEWER PIPING: Extra strength tongue and groove pipe conforming to ASTM C-76, Class III for reinforced pipe.

B. JOINT SEALS:
   1. Under 42" diameter: Provide Talcote Asphalt Primer No. 041 and Talcote Cold Plastic No. 052 joint compound.
   2. 42" diameter and larger: Bell and rubber gasketed joints.

C. CONCRETE: Minimum compressive strength of 2,500 psi. Conform to requirements of Cast in Place Concrete Section 3.

D. POLYVINYL CHLORIDE (PVC) SDR 26 PIPING: Provide PVC piping where indicated on the drawings. Jointing shall be solvent weld or bell and gasket meeting requirements of ASTM 3212. Piping shall meet requirements of ASTM D-3034.

E. INLETS:
   1. Precast concrete, cast in place concrete or brick collection boxes as indicated in the drawings. Brooks Products or equivalent. Form both inner and outer walls for cast-in-place items.
   2. Brick: ASTM C-32 sewer brick, Grade SS, 2-¼" x 3-¾" x 8".
   3. Gratings, Covers and Frames: Cast iron, McKinley, Neenah or approved equal. Heavy duty in paving. Medium duty in walks. Light duty in grass or planting areas.

PART 3 - EXECUTION

3.01 INSTALLATION

A. INLETS:
   1. All storm sewer inlets shall be constructed to the line and grade and

at location shown on the drawings. Inlets shall be constructed in strict accordance with details as indicated in the drawings.

2. When the box section of the inlet has been completed, the floor of the inlet shall be shaped by filling with one-two mortar to conform to the section shown on the detail drawings.
3. Cast iron inlet frames and grates shall be accurately adjusted to line, grade and slope and grouted in place with mortar consisting of one part Portland Cement to two parts sand.

B. PIPING:

1. Inspection: Review drawings and job conditions and verify all inverts before trenching to avoid conflict with other below grade utilities either planned or existing. Immediately notify Architect of any apparent conflicts before beginning work.
2. Trenching: Provide trenching in strict compliance with current OSHA regulations and in accordance with **Trench Safety Section. Do not trench ahead of pipe laying unless trench is protected**.
3. Begin excavation work at the lower end of flow line and proceed to higher flow line. Avoid over-excavating; return over-excavated bed to grade and thoroughly compact. Remove large rocks, foreign or organic material; return bed to grade and thoroughly compact.
4. Lay all pipe on required bedding to a true line slope as indicated in the drawings. Hand excavate at joints to ensure that full length of pipe lays on a solid bed. Install tongue end of pipes facing direction of drainage flow.
5. Bedding and backfilling of pipe:
   a. Bed and backfill all piping in accordance with the details indicated on the drawings. Where local or other applicable codes require more stringent specifications, those codes shall govern.
   b. All piping located in County Flood Control District right of way shall be bedded and backfilled with cement stabilized sand in accordance with Flood Control District requirements.
   c. Cement stabilized sand shall be a homogeneous mixture of 1½" sacks Portland Cement per cu yd of mixed material. Provide greater cement content where required by City or County Requirements.

END OF SECTION

(Referenced from 2004 TxDOT, ITEM 502 Barricades, Signs and Traffic Handling – references made to any other Sections of the 2004 TxDOT Manual shall become part of the Contract to be followed)

09100.1. Description. Provide, install, move, replace, maintain, clean, and remove upon completion of work all barricades, signs, cones, lights, and other traffic control devices used for traffic handling as indicated on the plans and as directed.

09100.2. Construction. Provide traffic control devices that conform to details shown on the plans and the TMUTCD.

A. **Implementation.** Before beginning work, designate in writing a Contractor's Responsible Person (CRP) to be the representative of the Contractor who is responsible for taking or directing corrective measures of installation and maintenance deficiencies as soon as possible. The CRP must be accessible by phone and able to respond to emergencies 24 hours per day.

Follow the traffic control plan (TCP) and install traffic control devices as shown on the plans and/or as directed by ENGINEER. Install traffic control devices straight and plumb. Do not make changes to the location of any device or implement any other changes to the TCP without the approval of the Engineer. Minor adjustments to meet field constructability and visibility are allowed.

Submit Contractor-proposed TCP changes, signed and sealed by a licensed professional engineer (as required), to the Engineer for approval. The Engineer may develop, sign, and seal Contractor-proposed changes. Changes must conform to guidelines established in the TMUTCD.

Maintain traffic control devices by taking corrective action as soon as possible. Corrective action includes but is not limited to cleaning, replacing, straightening, covering, or removing devices. Maintain the devices such that they are properly positioned, spaced, and legible, and that retroreflective characteristics meet requirements during darkness and rain.

B. **Flaggers.** Provide a Contractor representative who has been certified as a flagging instructor through courses offered by the

Texas Engineering Extension Service, the American Traffic Safety Services Association, the National Safety Council, or other approved organizations. Provide the certificate indicating course completion when requested. This representative is responsible for training and assuring that all flaggers are qualified to perform flagging duties. A qualified flagger must be independently certified by one of the organizations listed above or trained by the Contractor's certified flagging instructor. Provide the Engineer with a current list of qualified flaggers before beginning flagging activities. Use only flaggers on the qualified list.

Flaggers must be courteous and able to effectively communicate with the public. When directing traffic, flaggers must use standard attire, flags, signs, and signals and follow the flagging procedures set forth in the TMUTCD.

C. **Removal.** Upon completion of work, remove all barricades, signs, cones, lights, and other traffic control devices used for work-zone traffic handling, unless otherwise shown on the plans.

09100.3. MEASUREMENT AND PAYMENT

A. When listed as a separate contract pay item, shall be measured in accordance with "Measurement and Basis of Payment" section or as shown on the Bid Proposal Form.

B. When not listed as a separate contract pay item, shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as provided in the proposal contract.

C. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SPECIFICATIONS

Edinburg Economic Development Corporation
North Park Restrooms
Edinburg, TX.

More Attentive Service

Milnet Architectural Services, PLLC

608 S. 12th Street
McAllen, Texas 78501

Phone: 956-688-5656
Fax: 956-687-9289
Website: www.milnet-archservices.com

Project No. 219018

Set No:

Edinburg Economic Development Corp.
North Park Restrooms

PROJECT MANUAL

Plans and Specifications – Project No. 219018

Edinburg Economic Development Corporation
North Park Restrooms

Edinburg, Texas 78539

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
333 Guadalupe, Suite 2-350, AUSTIN, TX 78701-3942
(Tel: 512/305-9000)
HAS JURISDICTION OVER INDIVIDUALS LICENSED UNDER
THE ARCHITECT'S REGISTRATION LAW
ARTICLE 249a, VERNON'S CIVIL STATUTES".

MILNET ARCHITECTURAL SERVICES, PLLC
608 S. 12th St.
McALLEN, TEXAS 78501
(956) 688-5656 - FAX (956) 687-9289

Edinburg Economic Development Corporation
North Park Restrooms
Edinburg, Texas 78539
MAS Project No. 219018

SECTION 01 11 00 - SUMMARY

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SUMMARY OF WORK

A. Project Identification: As follows:

1. Project: North Park Restrooms
2. Owner: City of Edinburg
3. Location: US281 Frontage road (I-2) south bound and Cullen St. Edinburg, Tx.

B. Contract Documents dated August 14, 2019 were prepared by Milnet Architectural Services, 608 S. 12th St. McAllen, TX. 78501.

C. The Work consists of the new construction of restrooms and concession stand.

1.3 WORK RESTRICTIONS

A. Contractor's Use of Premises: During construction, Contractor shall have **limited** use of **site** indicated. Contractor's use of premises is limited only by Owner's right to perform work or employ other contractors on portions of Project.

B. Assume full responsibility for the protection and safekeeping of Products under this Contract, stored on the site.

C. Move any stored Products, under Contractor’s control, which interfere with operations of the Owner and separate contractor.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 20 00 - PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 UNIT PRICES

A. Changes to the Work incorporating Unit Prices will be made by Change Order.

1.3 CONTRACT MODIFICATION PROCEDURES

A. On Owner's approval of a proposal from Contractor, Architect will issue a Change Order on AIA Document G701, for all changes to Contract Sum or Contract Time.

B. When Owner and Contractor disagree on the terms of a proposal, Architect may issue a Construction Change Directive on AIA Document G714, instructing Contractor to proceed with the change. Construction Change Directive will contain a description of the change and designate the method to be followed to determine changes to Contract Sum or Contract Time.

1.4 PAYMENT PROCEDURES

A. Submit a Schedule of Values **at least 10 days before** the first Application for Payment. In Schedule of Values, break down Contract Sum into at least one line item for each Specification Section. Correlate the Schedule of Values with Contractor's Construction Schedule.

B. Submit 3 copies of each application for payment on AIA Document G702/703, according to the schedule established in Owner/Contractor Agreement.

1. For the second Application for Payment through the Application for Payment submitted at Substantial Completion, submit partial releases of liens from each subcontractor or supplier for whom amounts were requisitioned in the previous Application for Payment.
2. Submit final Application for Payment after completion of Project closeout procedures with release of liens and supporting documentation. Include consent of surety to final payment and insurance certificates.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 25 00 – SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SUBSTITUTION REQUIREMENTS

A. When material, article, or method is specified using name of proprietary product manufacturer, vendor, or method followed by phrase "or equal," specific item mentioned establishes basis upon which projects are to be built.

1. Other manufacturers' materials, articles, and methods not named will be considered as substitutions provided required information is submitted on “SUBSTITUTION REQUEST FORM” and will not require substantial revisions of Contract Documents.

2. This applies to specific construction methods when required by Contract Documents.

3. Substitution Requests must be filled out on enclosed “Substitution Request Form”.

B. Whenever material, article, or method is specified or described without phrase "or equal," no substitutions will be allowed.

C. Costs for redesigns due to substituted items are responsibility of Applicant.

D. In making request for substitution, Applicant/Contractor represents that he:

1. Has personally investigated proposed product or method and determined that it is equal in all respects to that specified.

2. Will provide same guarantee for substitution as for product or method specified.

3. Will coordinate installation of accepted substitution into work, making design and construction changes to complete work in all respects following the Contract Documents.

1.3 SUBMITTAL OF DATA FOR PROPOSED SUBSTITUTIONS

A. In order for substitutions that do not change design intent to be considered, submit no later than 10 days prior to bid date deadline, 3 copies of complete data set forth herein to permit complete analysis of proposed substitutions listed on submitted “SUBSTITUTION REQUEST FORM”.

1. For Products:
   a. Identification including manufacturer's name and address.
   b. Manufacturer's literature, including but not necessarily limited to:
      1) Product description, performance, and test data.
      2) Reference standards.
   c. Samples where appropriate.
   d. Name and address of similar projects on which product was used and dates of installation with contact name and telephone number.

2. For Construction Methods:
   a. Detailed description of proposed method.
   b. Drawings illustrating methods.
   c. Name and address of similar projects on which method was used and dates of use with contact name and telephone number.

3. Comparison of proposed substitution with product or method specified

4. Data relating to impact on construction schedule by proposed substitution.

5. Impact on other contracts.

1.4 APPROVAL OF SUBSTITUTION

A. Architect's decision regarding evaluation of substitutions will be final and binding.

B. All approved substitutions will be incorporated into the Contract Documents by Addendum.

PART 2 - PRODUCTS
NOT USED

PART 3 - EXECUTION
NOT USED

SUBSTITUTION REQUEST FORM

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01340 Submittals
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01340 Submittals
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: Date:

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

END OF SECTION

SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 PROJECT MANAGEMENT AND COORDINATION

A. Verify layout information shown on Drawings, in relation to property survey and existing benchmarks, before laying out the Work.

B. Coordinate construction to ensure efficient and orderly execution of each part of the Work.

C. Progress meetings will be held at Project site every two weeks. Notify Owner and Architect of meeting dates. Each subcontractor or other entity concerned with current progress or involved with planning or coordination of future activities, shall attend. The Contractor shall:

1. Prepare a progress meeting agenda.

2. Prepare a sign in sheet for each progress meeting.

3. Prepare minutes of each meeting and distribute to parties present.

1.3 CONSTRUCTION SCHEDULE

A. Prepare a horizontal bar-chart construction schedule. Provide a separate time bar for each activity and a vertical line to identify the first workday of each week. Use same breakdown of Work indicated in the Schedule of Values. As Work progresses, mark each bar to indicate actual completion.

1. Submit within twenty (20) days after date established for Commencement of the Work.
2. Coordinate each element with other activities. Show each activity in proper sequence. Indicate sequences necessary for completion of related Work.
3. Indicate Substantial Completion and allow time for Architect's procedures necessary for certifying Substantial Completion.
4. Schedule Distribution: Distribute copies to Owner, Architect, subcontractors, and parties required to comply with dates.

5. Updating: Revise the schedule after each meeting or activity where revisions have been made. Distribute revised copies to Owner, Architect, subcontractors, and parties required to comply with dates.

1.4 SUBMITTAL PROCEDURES

A. Coordinate submittal preparation with construction schedule, fabrication lead-times, other submittals, and activities that require sequential operations.

1. No extension of Contract Time will be authorized due to failure to transmit submittals in time to permit processing sufficiently in advance of when materials are required in the Work.
2. Architect will not accept submittals from sources other than Contractor.

B. Prepare submittals by placing a permanent label on each for identification. Provide a 4 by 5 inch space on the label or beside title block to record review and approval markings and action taken. Include the following information on the label:

1. Project name.
2. Date.
3. Name and address of Contractor.
4. Name and address of subcontractor or supplier.
5. Number and title of appropriate Specification Section.
6. Contractor's certification that materials comply with specified requirements.

C. Coordinate each submittal with other submittals and with work that does not require submittals.

D. Product Data: Mark each copy to show applicable choices and options. Include the following:

1. Data indicating compliance with specified standards and requirements.
2. Notation of coordination requirements.
3. For equipment data, include rated capacities, dimensions, weights, required clearances, and furnished specialties and accessories.

E. Shop Drawings: Submit newly prepared information drawn to scale. Do not reproduce Contract Documents or copy standard information. Submit 1 reproducible print and 1 blue- or black-line print on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches. Architect will return the reproducible print. Include the following:

1. Dimensions, profiles, methods of attachment, coordination with adjoining work, large scale details, and other information, as appropriate for the Work.
2. Identification of products and materials.
3. Notation of coordination requirements.
4. Notation of dimensions established by field measurement.
5. Identification of deviations from Contract Documents.

F. Samples: Submit Samples finished as specified and identical with the material proposed. Where variations are inherent in the material, submit sufficient units to show limits of the variations. Include product name or name of the manufacturer.

G. Architect will review each submittal, mark as appropriate to indicate action taken, and return copies less those retained. Compliance with specified requirements remains Contractor's responsibility.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 33 00 - SUBMITTALS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide shop drawings, product data, physical samples and color samples as indicated herein and in each technical section of these specifications.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Additional submittal requirements specific to the particular section of the specifications.

PART 2 - PRODUCTS

2.1 SHOP DRAWINGS

A. Prepare shop drawings using competent draftsmen, clearly and precisely showing the following:
   1. The size and gage of members.
   2. The method of anchoring and securing members of parts together.
   3. The quantity and location of each item.
   4. Other pertinent data necessary to show the Work to be done and where and how it is to be done.

B. Prepare Drawings to scale, including full size details as required to fix and illustrate the Work required. Do not use Contract Documents or reproductions thereof as shop drawing submittals.

C. Each sheet of Drawings shall be 30 x 40 inches maximum size with borders. Provide a title block in the lower right hand corner with the following information:
   1. Title of the sheet.
   2. Name and location of Project.
   3. Names of:
      a. Architect/Engineer.
      b. General Contractor.
      c. Manufacturer of the specified materials and equipment.

4. The date of the Submittal.
5. The date of each correction or revision.
6. **Submittal number including Division No.** (such as submittal no. 3 under Division 11 is numbered "11-03").

D. Fold drawings to 8-1/2x11 inch dimensions with title block exposed to top.

E. Check the Drawings and add any corrections of field measurements needed. Stamp and sign the Contractor's approval, checker's signature, and date of approval before submitting to the Architect. Shop Drawings which do not bear the Contractor's stamp or have not been reviewed by the Contractor, will be returned by the Architect without review or approval.

F. Number Shop Drawings consecutively. Indicate working and erection dimensions, arrangements, sectional views, necessary details including complete information for making connections with other Work, kinds of materials, and finishes.

G. Provide a transmittal letter in duplicate, pointing out any deviations from items, methods or named manufacturers included in the Specifications or on the Drawings. Note submittal file number including Division.

H. Submit **six (6)** blue line prints of each Shop Drawing sheet.

I. Make such corrections, changes, resubmit bound sets of Shop Drawings prints, as required herein, until approved is obtained. Any corrections or changes indicated on Shop Drawings shall not be considered as an extra work order.

2.2 PHYSICAL SAMPLES

A. Provide duplicate samples of items as specified. Samples shall be 12 inches square or 12 inches long unless noted otherwise. Minimum liquid samples shall be 1 pint. Installed materials shall match approved samples.

B. For Architect's permanent files provide one (1) 6" x 6" sample of all interior finishes, colors and materials (aluminum finish, glazing, plastic laminate, paint finish flooring materials, ceiling finish, etc.)

C. Provide a transmittal letter with each sample, listing the following:
1. Specification section title and paragraph specifying the material.
2. Name and location of Project.
3. Names of:
   a. Architect/Engineer.
   b. General Contractor.
   c. Manufacturer of the specified materials and equipment.
4. The date of the Submittal.
5. Submittal file number including Division.

D. If samples are not acceptable they will be returned directly to the Contractor for modification and resubmission.

E. If samples are acceptable, notification will be sent directly to the Contractor, and the sample retained for comparison with the complete Work.

2.3 MANUFACTURER'S PRODUCT DATA

A. Provide **six (6)** copies of pre-printed Product Data of items as specified. Carefully mark out all items not applicable to the specified item.

B. Standard catalogs, brochures, etc. including information not applicable to the project and not marked through, will be returned without review or approval.

C. Provide a transmittal letter with the Product Data from each manufacturer, listing the following information:
   1. Name and location of Project.
   2. Names of:
      a. Architect/Engineer.
      b. General Contractor.
      c. Manufacturer of the specified materials and equipment.
   3. The date of the Submittal.
   4. Submittal file number including Division.

D. If Product Data is not approved, one copy will be marked and returned directly to the Contractor for modification and resubmission.

E. If Product Data is approved, notification and one copy of the acceptable Product Data will be sent directly to the Contractor.

F. When requested by the Architect, provide six (6) copies of each ASTM Federal Specification, or other applicable documents referenced in the material Section.

PART 3 - EXECUTION

3.1 REVIEW PROCEDURE

A. Submittals will be reviewed with reasonable promptness so as to cause no delay, but only for conformance with the design concept of the project and with the information given in the Contract Documents. Architect shall be allowed a maximum review period of **fourteen (14)** calendar days. The review of a separate item shall not indicate a review of an assembly in which the item functions. Submittals that contain excessive errors or that are incomplete will be returned without review and approval and any delay caused thereby shall be the responsibility of the Contractor.

B. If any submittals are not approved as submitted, all copies will be returned directly to the Contractor for revision. The reviewed submittals will be returned to the Contractor as soon as practicable.

C. The Contractor shall make all revisions as noted and shall resubmit the required number of corrected copies of submittals, until no exceptions are taken. The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, to revisions other than those requested on previous submissions.

D. The review of submittals shall not relieve the Contractor of responsibility for deviations from the requirements of the Contract Documents unless the Contractor has submitted, in writing, such deviations and written approval has been given to each specific deviation. The review shall not relieve the Contractor from responsibility for errors and omissions in the Shop Drawings and samples.

E. No portion of the Work requiring a submittal shall commence until the submittal has been approved as designated in the Conditions of the Contract. All such portions of the Work shall be in accordance with the submittal that has been stamped with final "Reviewed Without Exceptions" note, or "Approved" note.

F. Materials and equipment specified or approved prior to beginning the Work are required to be used on the Project. Any proposed substitution resulting from no availability of specified items must be proven "better than" by the Contractor and approved in writing by the Architect. Substitutions included in submittals shall be so noted and brought to the Architect's attention in the submittal and on the transmittal. Failure to follow this procedure will render the substitution as not acceptable whether or not reviewed by the Architect.

G. The Contractor shall have the approved shop drawings at the site at all times for use in the construction of the Work. Failure of the Contractor to supply such drawings will be deemed sufficient cause to delay the Work until such drawings are available for field use and reference.

H. For submittals that will be reviewed by one of the Architect's consultants, these submittals shall be delivered directly to the Architect. The Architect will then be responsible to provide the Consultant with a copy of the submittal.

I. For submittals that will be reviewed by one of the Architect's consultants, do not send to the Consultant as part of the package any items which will be reviewed by the Architect. As an example, do not provide a single submittal package combining Structural Steel and Miscellaneous Metal Fabrications.

END OF SECTION

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION REQUIREMENTS

A. Quality-control services include inspections, tests, and related actions including reports. Quality-control services are further specified in other Sections of these Specifications and shall be performed by independent testing agencies provided by Contractor or Owner, as specified.

1. Unless otherwise indicated, quality-control services required by authorities having jurisdiction will be provided by Owner.

B. Contractor is responsible for scheduling inspections and tests.

C. Retesting: Contractor shall pay for retesting where results of inspections and tests prove unsatisfactory and indicate noncompliance with requirements.

D. Auxiliary Services: Cooperate with agencies performing inspections and tests. Provide auxiliary services as requested. Notify agency in advance of operations requiring tests or inspections, to permit assignment of personnel. Auxiliary services include the following:

1. Access to the Work.
2. Incidental labor and facilities to assist inspections and tests.
3. Adequate quantities of materials that require testing, and assisting in taking samples.
4. Facilities for storage and curing of test samples.
5. Security and protection of samples and test equipment.

E. Duties of Testing Agency: Testing agency shall cooperate with Architect and Contractor in performing its duties. Agency shall provide qualified personnel to perform inspections and tests.

1. Agency shall promptly notify Architect and Contractor of irregularities or deficiencies observed in the Work during performance of its services.
2. Agency shall not release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
3. Agency shall not perform duties of Contractor.

F. Submittals: Testing agency shall submit a certified written report of each inspection and test to the following:

1. Owner.
2. Architect.
3. Contractor.
4. Structural engineer.
5. Authorities having jurisdiction, when authorities so direct.

G. Report Data: Reports of each inspection, test, or similar service shall include at least the following:

1. Name, address, and telephone number of testing agency.
2. Project title and testing agency's project number.
3. Designation (number) and date of report.
4. Dates and locations where samples were taken or inspections and field tests made.
5. Names of individuals taking the sample or making the inspection or test.
6. Designation of the product and test method.
7. Complete inspection or test data including an interpretation of test results.
8. Ambient conditions at the time of sample taking and testing.
9. Comments or professional opinion on whether inspected or tested Work complies with requirements.
10. Recommendations on retesting or reinspection.
11. Name and signature of laboratory inspector.

H. Testing Agency Qualifications: Engage inspection and testing agencies that are prequalified as complying with the American Council of Independent Laboratories' "Quality Assurance Manual" and that specialize in the types of inspections and tests to be performed.

1. Each testing agency shall be authorized by authorities having jurisdiction to operate in the state where Project is located.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 50 00 — TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone and fax service, water, and sanitary facilities.

B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.

C. Construction Facilities: Access roads, parking, progress cleaning, project signage and temporary buildings.

1.3 TEMPORARY ELECTRICITY

A. Cost: By General Contractor. Utilize existing power service if approved by Owner. Extend temporary outlets in NEC and OSHA approved manner to facilitate construction.

B. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.

C. Provide main service disconnect and over correct protection at convenient location.

D. Provide sufficient and adequate distribution equipment, wiring, and outlets to ensure unimpeded progress of the Work.

E. Permanent convenience receptacles may be utilized during construction.

1.4 TEMPORARY LIGHTING

A. Provide and maintain lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft.

B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.

C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

D. Permanent building lighting may be utilized during construction.

E. Maintain lighting and provide routine repairs.

1.5 TEMPORARY HEAT

A. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.

B. Maintain minimum ambient temperature of 50 degrees F (10 degrees C) in areas where construction is in progress, unless indicated otherwise in product sections.

1.6 TEMPORARY COOLING

A. If required for the proper installation of particular materials, systems, or equipment, provide and pay for cooling devices and cooling as needed to maintain specified conditions.

1.7 TEMPORARY VENTILATION

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidify, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Utilize existing ventilation equipment if approved by Owner. Extend and supplement equipment with temporary fan units as required to maintain clear air for construction operations.

1.8 TELEPHONE SERVICE

A. Provide, maintain and pay for telephone service to field office.

1.9 FACSIMILE SERVICE

A. Provide, maintain and pay for separate telephone line to be used solely for fax service to field office.

1.10 TEMPORARY WATER SERVICE

A. Utilize existing water service if approved by Owner for construction operations.

B. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing as required.

1.11 TEMPORARY SANITARY

A. Provide and maintain required facilities and enclosures. Existing facility use is **not** permitted. Provide at time of project mobilization.

1.12 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas to protect existing facilities and adjacent properties from damage from construction operations and demolition. Barriers must isolate occupied use from construction activities. If and when needed, barriers must be capable of attenuating sound.

B. Provide protection for existing plant life and landscaped. Maintain plant life and landscaped areas as necessary during construction operations. Replace damaged plant life.

C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

D. Barrier plan and method subject to approval by the Architect and the Owner.

1.13 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6 foot high fence around construction site, equip with vehicular and pedestrian gates with locks. Fence must be capable of restricting entry by on-site facility users.

1.14 WATER CONTROL

A. Grade site to drain where additions are undertaken. Maintain excavations free of water. Provide, operate, and maintain pumping equipment and/or any other means, methods or techniques necessary to maintain excavation and site free of water.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.15 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protect for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

B. Provide temporary protection of existing wall cavities, substrates, and surfaces exposed to weather during cutting and minor demolition operations to prevent entrapment of moisture and development of mildew.

1.16 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection to prohibit damage and where specified in individual specification sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic in all landscaped areas.

1.17 SECURITY

A. Provide security and facilities to protect Work and existing facilities from unauthorized entry, vandalism, or theft.

B. Coordinate project security program with Owner's existing security operations at project mobilization.

C. Maintain program throughout construction period until Owner acceptance precludes the need for Contractor security.

D. Restrict entrance of persons and vehicles into Project site and existing facilities, allowing entrance only to authorized persons and persons identified by the Contract Document and/or the Architect or Owner as authorized to visit Project site.

1.18 ACCESS

A. Provide and maintain temporary roads accessing public thoroughfares to serve construction area.

B. Extend and relocate as work progress requires. Provide detours necessary for unimpeded traffic flow.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Existing on-site roads may be used for construction traffic.

1.19 PARKING

A. Provide temporary surface parking areas to accommodate construction personnel. Existing site areas may be used if approved in advance by the Owner.

B. Contractor to propose plan for Owner concurrence and approval.

1.20 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.

1.21 PROJECT IDENTIFICATION

A. Provide project sign. Refer to drawings for size and content.

B. Erect on site at location established by Architect.

C. No other signs are allowed without Owner permission except those required by law.

1.22 FIELD OFFICES AND SHEDS

A. Office: Weather tight with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture drawing rack, and drawing display table, phone and fax.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

C. Provide storage sheds and facilities to accommodate Work. Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products to requirements of Section 01 25 00.

D. Designated existing covered and uncovered hard paved areas and facilities may be used for field storage areas. Protect and secure existing areas used for storage. Upon completion of Work, clean, repair, and restore all existing areas used for storage and restore to acceptable condition.

1.23 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials prior to Substantial Completion.

B. Remove underground installation to a minimum depth of 2 feet. Grade site to drain.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

1.2 ACTION SUBMITTALS

A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

B. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction

photographic documentation, damage or settlement surveys, property surveys, and similar final record information.

3. Submit closeout submittals specified in individual Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.

5. Submit test/adjust/balance records.
6. Submit sustainable design submittals required in Division 01 sustainable design requirements Section and in individual Division 02 through 33 Sections.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."
6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in the following format:

    a. MS Excel electronic file. Architect will return annotated file.

1.8 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during

construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other

foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
g. Sweep concrete floors broom clean in unoccupied spaces.
h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
j. Remove labels that are not permanent.
k. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.

o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
p. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Division 01 Section "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01700

SECTION 03 50 00 - CONCRETE FLOOR FINISHING

PART 1 – GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 SUMMARY

A. This Section includes the following:

1. Finishing slabs-on-grade, monolithic floor slabs, and separate floor toppings.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for concrete slab construction and finish and concrete topping slabs.
2. Division 7 Section “Joint Sealers”

1.2 REFERENCES

A. The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise.

1. ACI 301 - Specifications for Structural Concrete for Buildings
2. ACI 302 - Guide for Concrete Floor and Slab Construction
3. ASTM E1155 - Determining Floor Flatness and Levelness Using the F-Number System (Inch-Pound Units).

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

B. Submittals

1. Product Data: Submit manufacturer's data showing compliance with the specifications for the following products:

a. Sealer

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.

B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

2.2 RELATED MATERIALS

A. Semi rigid Joint Filler: Two-component, semi rigid, 100 percent solids, epoxy resin with a Type A Shore durometer hardness of 80 per ASTM D 2240.

B. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

C. Saw cut joint filler: Euco 700 epoxy by The Euclid Chemical Company, or approved equal.

PART 3 - EXECUTION

3.1 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Concrete slabs shall be finished as specified below, within the tolerances specified elsewhere in this Section.

1. Highway straightedges are recommended for use in lieu of bull floats for all slab placement and finishing operations.
2. Screeding: Immediately after placing, slab shall be vibrated and struck off true by double screeding to the required level, at or below the elevation or grade of the finished slabs as indicated on the Drawings. Vibrators shall not be used to spread the concrete. When camber is indicated for slabs supported on formwork, screed to the required camber. Fixed screed guides are recommended where specified surface tolerance exceeds FF25/FL20.
3. Floating: Immediately after screeding, before any excess bleed water is present on the surface, float the surface using long-handled bull floats or darbies.

4. Straightedging: Immediately after screeding and before excess bleed water is present on the surface, straighten the surface using a highway straightedge.
5. Edging and jointing, where required, shall be done after bleed water has evaporated and before further finishing.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish.
2. Locations: All concrete surfaces under waterproofing membrane, setting beds for brick, mud-set tile, pavers, or terrazzo, and noncomposite topping slabs.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film- finish coating system.
2. Locations: Exposed concrete floors not otherwise specified, concrete surfaces under carpets, vinyl tile, thin set tile, wood flooring, elastomeric coatings, and painted concrete floors, and roof slabs that are future floors.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.2 FINISHING CONCRETE TOPPING SLABS

A. Place concrete floor topping continuously in a single layer, tamping and consolidating to achieve tight contact with bonding surface. Do not permit cold joints or seams to develop within pour strip.

1. Screed surface with a straightedge and strike off to correct elevations.
2. Slope surfaces uniformly where indicated.
3. Begin initial floating using bull floats to form a uniform and open-textured surface plane free of humps or hollows.

B. Finishing: Consolidate surface with power-driven floats as soon as concrete floor topping can support equipment and operator. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until concrete floor topping surface has a uniform, smooth, granular texture.

1. Provide floor finish as described above.

a. Finish surfaces to specified overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and levelness, F(L) 15, and notify independent testing agency to permit measurement within 24 hours according to ASTM E 1155 for a randomly trafficked floor surface.

b. Finish and measure surface so gap at any point between surface and an unleveled freestanding 10-foot-long straightedge, resting on 2 high spots and placed anywhere on the surface, does not exceed 1/4 inch.

3.3 CONTROL JOINTS IN TOPPING SLABS

A. Saw-cut Control Joints with Soff-Cut saw: After completion of finishing operation, cut control joints using a "Soff-Cut" brand electric saw along straight lines where called for on the Drawings. Follow manufacturer's instructions in using "Soff-Cut" saw. Sawcutting shall be done within 2 hours after the completion of finishing, but not so soon as to cause raveling of the joint. Cut to depth indicated on the Drawings.

1. After completion of finishing operations, cut control joints along straight lines where called for on the Drawings. Saw cutting shall be done within 4 hours after the completion of finishing, but not so soon to cause raveling of the joint. Cut to the depth indicated on the Drawings.

B. Form joints in concrete topping slabs at 8’-4” o.c. max.

C. Construct control joints for a combined depth equal to ¼ the topping thickness.

3.4 J OINT FILLING

A. Prepare, clean, and install joint filler per manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semi rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

1. Install joint-filler strips in lengths if practicable. Where more than one length is required, lace or clip sections together.

3.5 CONCRETE FINISH MEASUREMENT AND TOLERANCES

A. All floors are subject to measurement for flatness and levelness and shall comply with the following:
   1. Measurement Standard: All floors are subject to measurement for flatness and levelness, according to ASTM E1155, "Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System."

B. Two-Tiered Measurement Standard: Each floor test section and the overall floor area shall conform to the two-tiered measurement standard as specified herein.

   1. Minimum Local Value: The minimum local FF/FL values represent the absolute minimum surface profile that will be acceptable for any one test sample (line of measurements) anywhere within the test area.
   2. Specified Overall Value: The specified overall FF/FL values represent the minimum values acceptable for individual floor sections as well as the floor as a whole.

C. Floor Test Sections

   1. A floor test section is defined as the smaller of the following areas:

      a. The area bounded by column and/or wall lines.
      b. The area bounded by construction and/or control joint lines.
      c. Any combination of column lines and/or control joint lines.

   2. Test sample measurement lines within each test section shall be multidirectional along two orthogonal lines, as defined by ASTM E1155, at a spacing to be determined by the Owner's testing agency.
   3. The precise layout of each test section shall be determined by the Owner's testing agency.

D. Concrete Floor Finish Tolerance

   1. The following values apply before removal of shores. Levelness values (FL) do not apply to intentionally sloped or cambered areas, nor to slabs poured on metal deck or precast concrete.

      a. Typical:

Overall Value	FF25/FL20
Minimum Local Value	FF17/FL15

E. Floor Elevation Tolerance Envelope:

   1. The acceptable tolerance envelope for absolute elevation of any point on the slab surface, with respect to the elevation shown on the Drawings, is as follows:

      a. Slab-on-Grade Construction: +/- 3/4"
      b. Top surfaces of formed slabs measured prior to removal of supporting shores: +/- 3/4"
      c. Top surfaces of all other slabs: +/- 3/4"

d. Slabs specified to slope shall have a tolerance from the specified slope of 3/8" in 10'-0" at any point, up to 3/4" from theoretical elevation at any point.

3.6 FIELD QUALITY CONTROL

A. Concrete Floor Flatness and Levelness:

1. Measurement Standard: Floors shall be measured for flatness and levelness according to ASTM E1155, "Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System." Tolerances are specified in Section 03 30 00.
2. Time Period for Measuring and Reporting: All measurements shall be made by the testing laboratory or designated agency before the end of the next workday after the completion of finishing operations. For structural elevated floors, measurement shall also be made prior to removal of forms and shores. The Contractor shall be notified immediately after the measurements of any section are complete, and a written report of the floor measurement results shall be submitted within 72 hours after finishing operations are complete. The Contractor shall take immediate action to correct any work that is outside the specified tolerances.
3. Measuring Equipment: The concrete surface profile shall be measured using equipment manufactured for the purpose, such as the Dipstick Floor Profiler, as manufactured by the Edward W. Face Company, Norfolk, Virginia, or by other methods specified in ASTM E1155.
4. Floor Test Sections:

    a. A floor test section is defined as the smaller of the following areas:

        1) The area bounded by column and/or wall lines.
        2) The area bounded by construction and/or control joint lines.
        3) Any combination of column lines and/or control joint lines.

    b. Test sample measurement lines within each test section shall be multidirectional along two orthogonal lines.
    c. The precise layout of each test section shall be determined by the testing agency and shall be submitted for the Architect's review and approval.

3.7 REPAIRS

A. Defective Topping: Repair and patch defective concrete floor topping areas, including areas that have not bonded to concrete substrate.

B. Remedial Measures for Slab Finish Construction Not Meeting Specified Tolerances:

1. Application of Remedial Measures. Remedial measures specified herein are required whenever either or both of the following occur:

    a. The composite overall values of flatness or levelness of any test section or the entire floor installation measure less than specified values.

b. Any individual test sample (line of measurements) measures less than the specified absolute minimum flatness or levelness value.

2. Modification of Existing Surface:

a. If, in the opinion of the Architect or Owner's representative, all or any portion of the substandard work can be repaired without sacrifice to the appearance or serviceability of the area, the Contractor shall immediately undertake the approved repair method.
b. The Contractor shall submit for review and approval a detailed work plan of the proposed repair showing areas to be repaired, method of repair, and time required to make the repair.
c. Repair method(s), at the sole discretion of the Architect or Owner's Representative, may include grinding (floor stoning), planing, retopping with specified floor leveling compound, or any combination of the above.
d. All repair work shall be performed at no additional cost to the Owner and with no extension to the construction schedule.

3. Removal and Replacement:

a. If, in the opinion of the Architect/Engineer or Owner's Representative, all or any portion of the substandard work cannot be satisfactorily repaired without sacrifice to the appearance or serviceability of the area, the Contractor shall remove and replace the defective work as directed.
b. Replacement sections may be retested for compliance at the discretion of the Architect/Engineer or Owner's Representative.
c. All replacement work shall be performed at no additional cost to the Owner and with no extension to the construction schedule.

END OF SECTION

SECTION 04 05 13 — MORTAR

PART 1 - GENERAL

1.01 COORDINATION

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.02 SCOPE:

A. Perform all work required to furnish the Masonry Mortar indicated by the Contract Documents and furnish all supplementary items necessary for its proper installation.

B. The requirements of Division 0 – "Bidding and Contract Requirements" and Division 1 – "General Requirements" of this Project Manual shall apply to all Work required for this Section.

C. Application of Mortar used in the installation of masonry units is specified in each respective Unit Masonry Section and is not included in the work required for this Section.

1.03 SUBMITTALS:

A. Submit product data on all mortar and admixtures.

B. Submit certification that mortar and grout material meet ASTM standards.

1.04 PRODUCT DELIVERY AND STORAGE:

A. Delivery: Delivery materials to Project site dry and in unbroken containers.

B. Storage: Store materials above ground in waterproof shelters.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Material manufactured by any of the following manufacturers is acceptable, provided it complies with the Contract Documents.

1. PORTLAND CEMENT:
   a. Capitol — Lone Star
   b. Trinity — Texas Industries

c. Universal Atlas Cement

2. LIME:
   a. Gibsonburg Lime Products Co., Tiger Limes
   b. Texas Lime Company
   c. United States Gypsum Company
   d. National Gypsum Company

3. WATER PROOFING ADMIXTURE:
   a. Master Builders-Omicron Mortarproofing
   b. Sonneborn Building Products-Hydracide
   c. W.R. Grace-Hydratite Plus

4. MORTAR COLOR:
   a. Gray-

5. DRY BLOCK-One pound per cubic foot of cementitious material, ½ sack per sack of 2 sacks of cement fluted, split –face CMU for warranty purposes

B. Refer to Section 01 25 00 - Substitutions Procedures for manufacturers not listed above.

2.02 MATERIALS:

A.	Portland Cement:	ASTM C150, TYPE I.
B.	Hydrated Lime:	ASTM C207, TYPE S.
C.	Fine Aggregate:	ASTM C144,
D.	Coarse Aggregate:	ASTM C404, Size No. 8
E.	Water:	Clean and free of deleterious acids, alkalies, or organic matter.
F.	Waterproofing Admixture:	Omicron Mortarproofing, manufactured by Master Builders.
G.	Grout Admixture:	“Fluidifier” by Master Builders.
H.	Sealer:	“DEFY” Block Water Repellant

2.03 PROPORTIONS AND MIXING:

A. Meet requirements of ASTM C270 and proportion mortar types as specified.

B. Meet requirements of ASTM C476 for masonry grout and proportion grout type as specified.

C. Proportion material accurately and mix thoroughly by machine to a uniform consistency and color. Mix mortars with the maximum amount of water consistent with workability.

D. Do not use mortar that has begun to set. Retemper mortar by adding water if mortar begins to stiffen from evaporation or absorption of a part of the mixing water. Use and place mortar in final position within 2-1/2 hours after mixing.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. See specific section of Masonry Materials for installation instructions.

3.02 MORTAR SCHEDULE:

A. Exterior Masonry Walls:
   1. Mortar-Type S, ASTM C270.
   2. Waterproofing Admixture-***dry block required to provide warranty.***

B. Interior Masonry Partitions:
   1. Mortar-Type N, ASTM C270.

C. Interior Paving Tile:
   1. Mortar-Type S, ASTM C270.

D. Exterior Paving Tile:
   1. Mortar-Type M, ASTM C270.

3.03 GROUT SCHEDULE:

A. Paving Tile:
   1. Portland Cement-one part.
   2. Fine Aggregate-three parts.
   3. No lime.
   4. Sealer

END OF SECTION

SECTION 04 22 00 — CONCRETE MASONRY UNIT

PART 1 - GENERAL

1.01 COORDINATION

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.02 SCOPE:

A. Perform all Work required to complete the Concrete Unit Masonry indicated by the Contract Documents and furnish all supplementary items necessary for its proper installation.

B. The requirements of Division 0 – “Bidding and Contract Requirements” and Division 1 – “General Requirements” of this Project Manual shall apply to all Work required for this Section.

1.03 PRODUCTS INSTALLED UNDER THIS SECTION BUT SPECIFIED ELSEWHERE:

A. Section 04 05 13 – Mortar.

B. Section 07 92 00 – Sealants and Caulking.

1.04 SUBMITTALS:

A. Submit technical data for each type wall reinforcement, anchors and ties.

B. Submit 12” long sample of control joint filler.

C. Submit certificate that masonry units conform to ASTM and NBFU standards specified.

1.05 STORAGE AND HANDLING:

A. Handle materials in a manner to prevent breakage and chipping. Store materials on platforms raised free of ground and protect materials with stainproof tarpaulin covers.

1.06 ENVIRONMENTAL CONDITIONS:

A. Lay no masonry when the temperature of the air is 40°F. twenty-four (24) hours after laying. Do not build on frozen work.

B. Store masonry units on the job so that they are kept off the ground and protected from rain.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Material manufactured by any of the following manufacturers is acceptable, provided it complies with the Contract Documents.

1. REINFORCEMENT, ANCHORS AND TIES:

Duro-O-Wal	AA Wire Products Company
Heckman Build Products, Inc.	Hohmann and Barnard, Inc.
Masonry Reinforcing Corp. of America	National Wire Products Corp.

2. SPLIT FACE BLOCK SEALER:
"DEFY" Split Face Block Water Repellant

2.02 MATERIALS:

A. UNITS:
1. Hollow Concrete Masonry: ASTM C90, medium weight, Grade N-1

B. REINFORCEMENT:
1. Block Wall Joint Reinforcement:
ASTM A82, AA Wire Products Co., "BLOK-TRUS", AA600 two wire, width 2" less than wall thickness, standard weight galvanized ASTM A116, Class 1.
2. Lintel and Bond Beam Reinforcement: Domestic, ASTM A615, or ASTM A616, deformations ASTM A305. Unless otherwise shown on drawings provide 2-#4 Ø cont. lap 30 dias.

C. WATER: Clean and free of deleterious acids, alkalies or organic material.

D. <u>Bullnose edge at all masonry corners for interior walls. Provide sealer for all exterior split face c.m.u.</u>

PART 3 - EXECUTION

3.01 CONDITION OF SURFACES:

A. Do not commence with masonry work until foundation has properly cured a minimum of seven (7) days and reinforcing steel that is dowelled for masonry units has been approved.

B. Consult other trades and make provisions to permit installation of their work to avoid cutting and patching. Before closing up any pipe chase, or similar inaccessible spaces, remove all rubbish and sweep out areas to be enclosed.

3.02 PREPARATION:

A. Provide, install and maintain all scaffolding, staging and forms of protection necessary for execution of the work; substantially constructed, maintained, moved and dismantled as required to properly follow the sequence of operation.

B. Provide and install all shores and centering for the work, constructed true to require shape, size and form; well-braced and made rigid in all parts, and capable of supporting and sustaining the loads to which subjected.

C. Leave all shores and centering in place until the masonry has sufficiently set to safely carry its own weight and the added loads of construction. Shore free-standing walls to prevent windstorm damage until walls are protected.

D. Examine surfaces to receive masonry and report any discrepancies before commencing work. Accept no former measurements, but lay work according to the plans and dimensions thereon.

3.03 LAYING CONCRETE MASONRY UNITS:

A. Do not dampen units before laying, and do not lay units which have surface water or contain frost. Lay units plumb, level, and true to a line in running bond, or as indicated. Align on exposed face or as indicated.

B. Lay first course of masonry in full bed of mortar. Lay all other hollow units in a full mortar bed on shell surface and at ends.

C. Lay hollow units with the thicker edge of the face shell up and make all joints 3/8” thick. Lay corners prior to laying mid-portion of wall. Rock closures into place with the head joints shoved against the two adjacent units in place.

D. Cut units with power saw through the unit to insure straight, evenly cut edges. Do not use fractional parts of masonry units in the work where whole units can be used.

E. Avoid over-plumbing and pounding of the corners and jambs to fit stretcher units after setting in place. Remove mortar and replace with fresh mortar where adjustment must be made after initial settings.

F. Do not use masonry units having cracks, chipped edges, broken corners or other defects in exposed faces. Build walls full thickness as shown. Blocks with open cells exposed will not be permitted.

G. Provide all special precast lintels, fillers, closers, control joint units, trough tile, etc., required to form all corners, returns, openings, jambs, offsets, etc., to maintain a proper bond throughout all masonry work.

H. Protect all sills, ledges, off-sets, etc., from droppings of mortar and protect door jambs and corners from damage during construction.

I. Stop off longitudinal run of masonry only where absolutely necessary by racking one-half block length in each course. Remove loose mortar before new work is started.

J. Cover tops of walls at end of day’s work and when rain is imminent, with waterproof membrane. Overhang two feet on each side of wall and anchor securely. Protect masonry from weather or construction damage.

3.04 JOINTS:

A. Mortar joints shall be straight, clean and uniform in thickness. Tool joints of all walls to produce a dense surface well bonded to the edges. Joints which are not tight at the time of tooling shall be raked out, pointed, and then tooled.

B. Tool when the mortar is partially set but still sufficiently plastic to bond. Use a tool which compacts the mortar, pressing the excess mortar out of the joint rather than dragging it out.

C. Finish joints that will remain exposed with a tool slightly larger than the width of the joint to form a concave surface. Tool vertical joint first. Finish flush, joint that will not remain exposed.

D. Unless otherwise specified the horizontal and vertical mortar joints shall be 3/8" thick with full mortar coverage on the face shells and on the webs surrounding cells to be filled with grout.

E. Vertical head joints shall be buttered well for a thickness equal to the face shell of the unit and these joints shall be shoved tightly so that the mortar bonds with both units. Joints shall be solidly filled from the face of the block to at least the depth of the face shell.

3.05 REINFORCING:

A. Install continuous joint reinforcing 16" on centers for running bond. Install joint reinforcing in the first and second bed joint above and below openings extending 24" beyond each side of opening.

B. Lap splices a minimum of 6" and install prefabricated corners and tees at such locations. Do not extend reforcing through expansion joints. Center reinforcing in joint with 5/8" minimum mortar coverage on the exterior face and ½" minimum mortar coverage on the interior face.

C. Do not extend reinforcing through control joints when anchorage is provided on each side of joint. If no anchorage is provided at joint, extend reinforcing through control joint at 48" on center.

D. Reinforce bond beams and lintels as indicated with continuous bars placed as the work progresses. Maintain ½" minimum clear distance between masonry units and reinforcement.

3.06 ANCHORING:

A. Anchor interior partitions to abutting or intersecting walls by common bond or with prefabricated reinforcing tees.

B. Anchor interior load bearing partitions laterally a maximum of 12'-0" o.c. by either an intersecting partition or anchorage to foundation with 4-#4Ø dowels and continuous 4 #4Ø bars to top of wall. Grout fill cells to top of wall.

C. Do not attach construction supports to wall except where specifically permitted by the Architect.

D. Intersecting load bearing masonry walls and partitions shall be bonded by the use of rigid steel anchors at twenty-four (24) inches o.c. maximum. Corners shall have a standard masonry bond by overlapping units and shall be solid grouted.

3.07 CONTROL JOINTS:

A. Locate 3/8" wide control joints as indicated but do not exceed 30 feet on centers. Keep vertical joints straight, true and continuous from top to bottom of masonry.

B. Use sash units to form control joints and install continuous control joint filler with sash units tightly butted to compress neoprene flanges and completely seal joint. Where masonry abuts structural concrete or steel and control joint filler cannot be used, keep joint clean of mortar as work progresses or use expansion joint spacer.

C. Locate building expansion joints as indicated and install expansion joint spacer properly recessed back from face to allow for sealant.

3.08 EMBEDDED ITEMS:

A. Build in flashing, sleeves, anchors, clips, mechanical and electrical items, and accessories as work progresses. Accurately cut units to fit all plumbing, ducts, openings and electrical work with all holes neatly patched.

B. Install loose lintels, as indicated in full beds of mortar. Fill voids at metal frames with mortar and build in frame anchors.

3.09 GROUTING:

A. Fill with grout, vertical cells, bond beams, lintels and other structural members having reinforcement. Secure in place and inspect reinforcing before grouting. Keep mortar droppings out of grout space and puddle or vibrate all grout in place.

B. Provide solid bearing under structural members at least 8” vertically and at least 16” horizontally. Bearing shall be hollow units reinforced with 2#4Ø bars U.N.O. and filled with concrete grout.

C. Build masonry in filled cell construction to preserve the unobstructed vertical continuity of the cells to be filled. Fully bed all walls and cross webs forming such cells to prevent leakage of grout and strike cell joints smooth. Maintain a continuous vertical alignment of cells so the unobstructed cell area is not less than 2”x3”.

D. Grout vertical cells in lifts not to exceed 4’-0”. Stop grout where necessary at mid-point but not over openings, when filling trough unit and provide suitable dam to retain grout. Stop grout one and one half inches below the top of the last course when filling vertical cells to form key for next pour.

E. Grout from inside face of masonry and prevent grout from staining masonry face. Protect projecting surfaces from droppings and clean immediately any grout which comes in contact with face of masonry.

3.010 CLEANING:

A. Keep face of blockwork free from excess mortar while laying blocks. Clean blockwork that will remain exposed, promptly, with fiber brushes and clear water. Use of wire brushes or acid permitted only with specific approval.

B. Repair and repoint defective work and pin line holes to match adjacent similar work. Replace broken or damaged blocks.

END OF SECTION

SECTION 06 05 00 - DECORATIVE PLASTIC LAMINATE

PART 1 - GENERAL

1.0 COORDINATION

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.1 SECTION INCLUDES

A. Standard Decorative Laminates.
B. Chemical Resistant Decorative Laminates.
C. Moldings.
D. Adhesives.

1.2 RELATED REQUIREMENTS

A. Division 06: Wood, Plastics, and Composites (Interior Architectural Woodwork, Finish Carpentry, Architectural Wood Casework, Wood Paneling, Adhesives).
B. Division 08: Interior Doors.
C. Division 10: Interior Specialties (Toilet Partitions, Cubicles, Wall Paneling).
D. Division 12: Furnishings (Laminate Clad Casework, Specialty Casework, Residential Casework or Office, Retail, Hospitality, Institutional Furniture).

1.3 REFERENCES

A. Reference Standards: In addition to requirements, comply with applicable provisions of following for design, materials, fabrication and installation of component parts:
   1. NEMA LD3 - National Electrical Manufacturer Association.
   2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   3. ASTM E162 - Surface Flammability and 662 Rate of Smoke Generation.
   4. U.S. Coast Guard – Conforms to IMO FTP Code Part 2 (smoke toxicity) and Part 5 (surface flammability).

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.
B. Product Data:
   1. Submit product data, including manufacturer’s technical data sheet for specified products, including literature for high-pressure decorative laminate, adhesive for bonding plastic laminate, and substrate information as related.

C. Shop Drawings:
   1. Submit shop drawings showing layout, profiles and product components, including edge conditions, panel joints, accessories, designs and textures.

D. Samples:
   1. Submit selection and verification samples for product type, designs and textures.

E. Quality Assurance Submittals:
   1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties, if required.
   2. Manufacturer's technical data sheets for laminate and adhesives.
   3. Manufacturer's Material Safety Data Sheets (MSDS).
   4. Certifications:
      a. Recycled Content.
      b. Forest Stewardship Council (FSC).
      c. VOC compliance with local jurisdictions.

F. Submit GREENGUARD Indoor Air Quality or SCS Indoor Advantage Gold Certificates showing compliance with VOC requirements.

G. Maintenance: Submit 2 copies of manufacturer's Care and Maintenance Guide.

1.5 REGULARY REQUIREMENTS

A. Adhesives:
   1. SCAQMD (South Coast Air Quality Management District).
   2. Ozone Transport Commission (OTC) model Rule for Adhesives and Sealants.

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer Qualifications: Manufacturer producing product in ISO 9001 certified facility.
   2. Fabricator/Installer must be experienced in performing work of similar type and scope.

B. Mock-Ups:
   1. Install at project site using acceptable products and manufacturer approved installation methods. Obtain Architect's acceptance of finish color, texture, pattern, fabrication, and installation standards. Comply with Division 01 Quality Control.
   2. Mock-Up Size: 24" x 24"
   3. Maintenance: Maintain mock-up during construction for fabrication and installation comparison. If required, remove and legally dispose of mock-up when no longer required.
   4. Incorporation: If allowed, mock-up may be incorporated into final construction upon Architect's approval.

1.7 DELIVERY, STORAGE & HANDLING

A. Comply with Division 01 Product Requirements Sections.

B. Storage and Protection: Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements

and fabrication schedule with construction progress to avoid construction delays.

B. Adhesive: For best results, do not apply adhesives at temperatures below 65ºF.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Wilsonart LLC
2400 Wilson Place
Temple, Texas 76503-6110
254.207.7000, 800.433.3222, F: 254.207.2384
www.wilsonart.com

B. Substitutions: In Accordance with Section 01 25 00 Substitution Procedures

2.2 STANDARD DECORATIVE LAMINATES

A. Acceptable Product: Wilsonart Laminate.

B. Decorative surface papers, impregnated with melamine resins, bonded under heat and pressure to kraft papers impregnated with phenolic resins.

C. General Purpose Type: Wilsonart Type 107, having the following physical characteristics:
1. Sheet thickness: 0.048 inch nominal (1.22mm).
2. Exceeding performance requirements of NEMA LD 3 current revision, Grade HGS.
3. Surface burning characteristics in accordance with ASTM E 84; unbonded.
4. Patterns and Finishes: Selected from manufacturer's full range of available selections.

D. Vertical Surface Type: Wilsonart Type 335, having the following physical characteristics:
1. Sheet thickness: 0.028 inch nominal (0.71 mm).
2. Exceeding performance requirements of NEMA LD 3 current revision, Grade VGS and VGP.
3. Surface burning characteristics in accordance with ASTM E 84; unbonded.
4. Patterns and Finishes: Selected from manufacturer's full range of available selections.

E. Postforming Type: Wilsonart Type 350, having the following physical characteristics:
1. Sheet thickness: 0.039 inch nominal (1.00 mm).
2. Exceeding performance requirements of NEMA LD 3 current revision, Grade HGP.
3. Surface burning characteristics in accordance with ASTM E 84; unbonded.
4. Patterns and Finishes: Selected from manufacturer's full range of available selections.

2.3 CHEMICAL RESISTANT DECORATIVE LAMINATES

A. Acceptable Products: Wilsonart Chemsurf Chemical-Resistant Laminate.

B. Chemical resistant overlay and decorative alpha cellulose surface papers, impregnated with melamine resins, bonded under heat and pressure to kraft papers impregnated with phenolic resins.

C. Chemical Resistant Decorative Laminate: Wilsonart Type 390.
1. Sheet thickness: 0.034 inch nominal (0.86 mm).
2. Meeting bacterial resistance and susceptibility requirements of ASTM G 22.
3. Patterns and Finishes: Selected from manufacturer's full range of available selections.

2.4 ACCESSORY MATERIALS

A. Contact Adhesive:

1. Non-postforming:
   a. Wilsonart 1730/1731 Low VOC Contact Adhesive.
   b. Wilsonart 730/731 Contact Adhesive, Low VOC canister.
2. Postforming:
   a. Wilsonart H2O Contact Adhesive, water-based.
   b. Water-resistant, non-staining bond for common high pressure laminate (HPL) applications.

B. Cold Press PVA Adhesives
1. Wilsonart 3100 PVA Adhesive: For bonding decorative laminate to wood products.
2. Wilsonart 3105 PVA Adhesive: High solids, for bonding decorative laminate to wood products.
3. Wilsonart 3116 PVA Adhesive: For bonding decorative laminate to wood products and bonding paper-backed products.

C. Hot Press PVA Adhesives
1. Wilsonart 3131 PVA Adhesive: High solids for bonding decorative laminates to wood products.
2. Wilsonart 3132 PVA Adhesive: High solids for bonding decorative laminates to wood products.

D. Postforming and Pinch Rolling PVA Adhesives
1. Wilsonart 3000/3001 PVA Adhesive: High solids for bonding decorative laminate to wood products and postforming applications.

2.5 ADHESIVE APPLICATION EQUIPMENT

A. Manual Spray:
1. Binks
2. Devilbiss

B. Automatic Spray:
1. Binks
2. Devilbiss

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces for conditions that would adversely affect the performance of the decorative or edge performance.
B. Surfaces to be adhesively bonded should be clean, dry and free of any dust, loose paint, wax, moisture, dirt, grease, oil, rust, or other contaminants.

3.2 PREPARATION

A. Surface preparation: Precondition surfacing materials and surfaces to receive surfacing materials in accordance with manufacturer's printed installation instructions.
B. Allow substrates to acclimate to room temperature for 48 hours before bonding.

3.3 INSTALLATION

A. Install materials in accordance with AWS (Architect Woodwork Standards) and requirements of Section 06 40 00, Architectural Woodwork.

3.4 SPRAY APPLICATIONS

A. Comply with adhesive manufacturers printed installation instructions.
B. Apply adhesive uniformly to both surfaces and cover each surface a minimum of 80%.
C. Apply two coats of adhesive to porous surfaces. 100% coverage is recommended for edges.
D. Apply uniform downward pressure (30-40 psi minimum) across the entire bonded surface.

3.5 BRUSH APPLICATIONS

A. Comply with adhesive manufacturers printed installation instructions.
B. Apply adhesive with a brush or solvent-resistant medium nap roller. Apply adhesive uniformly to both surfaces and cover each surface 100%.
C. Provide two coats of adhesive on porous surfaces. Double coat edges.
D. Apply uniform downward pressure (30-40 psi minimum) across the entire bonded surface.

3.6 HAND APPLICATIONS

A. Comply with adhesive manufacturers printed installation instructions

3.7 CLEANING AND PROTECTION

A. Clean decorative plastic laminate in accordance with manufacturer's care and maintenance instructions.
B. Protect installed product and finish surfaces from damage during construction.

END OF SECTION

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide and install all rough carpentry, formwork, wood framing, blocking, wood furring, hardboard and related fasteners as indicated in the drawings or as required to complete the indicated construction.

B. Install all related hardware and fasteners. Provide and install wood furring and/or trim for acoustical panels.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Cast-in place concrete

B. Painting

C. Finish hardware

1.4 SECTION REQUIREMENTS

A. Submittals manufacturer’s printed literature describing wood preservatives treatment system and certifying that system meets all current requirements for applicable Federal, State and local governing agencies.

B. Submittals manufacturer’s printed literature describing fire retardant treatment system, any structural or usage limitations, and certifying that system meets all current requirements for applicable Federal, State and local governing agencies.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

1.6 DELIVERY AND STORAGE

A. Deliver and store lumber, plywood and hardwood on sills and cover for protection.

1.7 QUALITY ASSURANCE

A. All lumber and plywood shall be grade marked by Southern Pine Inspection Bureau, West Coast Lumber Inspection Bureau, American Plywood Association, or Western Wood Products Association.

B. All lumber and plywood shall be marked with producing manufacturer's trademark.

C. Certificate of inspection issued by grading association for bundled lumber and plywood may substitute for individual piece marking.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Dressed lumber, S4S, [**19**] [**15**] percent maximum moisture content for 2-inch (38-mm) thickness or less, marked with grade stamp of inspection agency.

2.2 TREATED MATERIALS

A. Preservative-Treated Materials: AWPA C2 lumber and AWPA C9 plywood, labeled by an inspection agency approved by ALSC's Board of Review. After treatment, kiln-dry lumber and plywood to 19 and 15 percent moisture content, respectively. Treat indicated items and the following:

1. Wood members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Concealed members in contact with masonry or concrete.
3. Wood framing members less than 18 inches (460 mm) above grade.
4. Wood floor plates installed over concrete slabs directly in contact with earth.

B. Fire-Retardant-Treated Materials: AWPA C20 lumber and AWPA C27 plywood, interior Type A treatment, labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Use treated lumber and plywood with bending strength, stiffness, and fastener-holding capacities that are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions.

2.3 LUMBER

A. Miscellaneous Lumber: No. 3 or Standard grade of any species for nailers, blocking, and similar members as indicated on drawings.

2.4 MISCELLANEOUS PRODUCTS

A. Fasteners: Size and type indicated. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.

1. Power-Driven Fasteners: CABO NER-272.
2. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

B. Metal Framing Anchors: Hot-dip galvanized steel of structural capacity, type, and size indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. COORDINATION: Coordinate work with other trades and provide cutting and patching required to accommodate the work. Verify all dimensions by taking field measurements to ensure proper fit. Accurately cut framing and blocking, and fit true to line and level, avoiding shims and wedges.

B. Fit rough carpentry to other construction; scribe and cope for accurate fit. Correlate location of furring, blocking, and similar supports to allow attachment of other construction.

C. ANCHORING AND FASTENTING: Use largest practicable fasteners for each type of work. Bolt nailers and blocking to steel, masonry or concrete members using bolts of proportionate strength to members attached. Unless otherwise noted in the drawings use ¾” diameter bolts at maximum 4’-0” centers. Use concealed fasteners in finish work, set nails and use flathead countersunk screws.

D. WOOD BLOCKING: Install fire-retardant tread wood blocking between metal studs where wall-supported drinking fountains, casework, railings, and other equipment is attached. Install between studs for toilet partitions systems and toilet accessories where anchored to wall. Use minimum 2 x 4 dimension where not indicated otherwise in the drawings.

END OF SECTION

SECTION 07 10 00 — DAMPPROOFING AND WATERPROOFING

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide and install below-grade waterproofing.

B. Provide and apply dampproofing on weather side of inside wythe of all exterior masonry cavity walls.

C. Provide and apply dampproofing and joint taping on weather side of gypsum board sheathing.

D. Provide and install membrane waterproofing (flashing) at exterior walls as indicated in the drawings and specified herein.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Unit masonry.

B. Gypsum sheathing.

C. Flashing at roof.

D. Plastic membrane under slab-on-grade.

E. Waterstops.

F. Metal thru-wall flashing.

1.4 SUBMITTALS

A. Submit manufacturer’s printed literature describing each material, restrictions, and manufacturer’s recommended procedures. Submit samples of each material.

B. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the Work under this section for a period of one year after the date of Substantial Completion of the Project.

1.6 QUALITY ASSURANCE

A. Waterproofing company shall have a minimum of 3 years experience in the dampproofing and waterproofing of building structures of similar size and scope as this project.

B. Retain at the job site a properly calibrated gauge for use by the Architect to verify applied thickness of materials.

PART 2 - PRODUCTS

2.1 WALL MATERIALS

A. MEMBRANE FLASHING: 40 mil thick polyethylene backed SBS modified bitumen self-adhering black membrane; “Protecto Flash” as manufactured by Protecto Wrap Co. or “Perm-A-Barrier” as manufactured by W.R. Grace and Co. or “Blueskin SA” as manufactured by Henry Company. Membrane shall comply with the following:

1. Tensile Strength: ASTM D412; 1400 psi.
2. Elongation: ASTM D412; 200% min.
3. Water Absorption: ASTM D570; 0.1% max.

B. DAMPPROOFING: Non-asbestos emulsion type coating No. 352 over No. 207 adhesive primer, as manufactured by Gulf States Asphalt or approved equivalent by Henry Company, Karnak, W.R. Meadows, Celotex, or Sonneborn. Comply with ASTM D1227, Type 1.

C. SHEATHING TAPE: 4” wide glass fabric scrim complying with ASTM D1668 or 40 mil thick polyethylene backed SBS modified bitumen self-adhering tape as manufactured by Protecto Wrap Co. or equivalent by W.R. Grace and Co or Henry Company. Verify compatibility of tape with proposed dampproofing.

2.2 BELOW GRADE WATERPROOFING:

A. WALLS: “Hydrocide Liquid Membrane 5000T”, one part cold applied elastometric, modified urethane. Trowel applied, non-sag, as manufactured by Sonneborn or approved equivalent by Toch Bros. or Tremco or Henry Company.

B. SLABS: “Hydrocide Liquid Membrane, HLM 5000” Cold Applied Seamless Elastomeric, Modified Urethane for use between concrete seal slab and concrete slab-on-grade as manufactured by Sonneborn or approved equivalent by Toch Bros. or Tremco or Henry Company.

C. PROTECTION BOARD: Water-resistant, semi-rigid panel composed of a core of asphalt and inorganic mineral filler particles, bottom reinforcing cover of asphalt-saturated felt and top cover of fiber glass mat weather-coated with a bond-breaking film, as manufactured by W.R. Meadows, Inc or Henry Company.

D. INSIDE ELEVATOR PIT: "Sonoblock" cementitious base slurry as manufactured by Sonneborn-Contech.

E. WATERSTOPS: Reference concrete section.

2.3 SHOWER PANS:

A. MEMBRANE SHOWER PAN: 30 mil thick synthetic, heavy-duty, flexible membrane PVC sheet, Nervastral 300.

PART 3 - EXECUTION

3.1 INSPECTION

A. Contractor shall inspect exterior face of all masonry cavity walls to ensure that all penetrations and joints are completely filled prior to dampproofing operations beginning.

3.2 MEMBRANE FLASHING

A. Prime concrete and masonry surfaces scheduled to receive membrane flashing using flashing manufacturer's recommended primer to ensure good adhesion.

B. WALL FLASHINGS: Shall be installed above all openings occurring in an exterior wall, at base of exterior wall, and at wall interruptions by columns, beams, slabs, spandrels and other locations as indicated in the drawings. Flashing shall extend to within 1" of outside face of wall, shall be continuous and shall extend through cavity and be turned up to the top first course above finish floor on face of inner wythe, and to extend 1" minimum into back up or inner wythe. End laps to be 9" and side laps 6".

C. STEEL STRUCTURE: Cover all steel columns or beams in exterior walls not protected by dampproofed concrete block or sheathing. Cover steel completely with membrane flashing lap 6" on to masonry on each side of columns. Conform and adhere to steel shapes not fireproofed. Cover all protruding angles or miscellaneous steel.

D. FRAMES: Install at exterior window and door frames and other locations as indicated in the drawings.

E. SHEATHING: Wrap all corners of gypsum board sheathing. See drawings for other details.

3.3 SHEATHING TAPE: Use one of the following systems:

A. Imbed and cover glass fabric scrim tape in dampproofing mastic at all joints, cracks and penetrations at gypsum board sheathing.

B. Apply specified self-adhering tape continuously over all joints, cracks and penetrations prior to beginning dampproofing operations.

3.4 DAMPPROOFING

A. Spray or brush apply dampproofing coating to weather side of all gypsum sheathing and primed concrete block back-up at exterior masonry cavity walls in accordance with the following:
   1. Primer: Minimum ½ gallon material per 100 sq. ft. of wall surface.
   2. Coating: Minimum 2/32" (62.5mils) dry film thickness and minimum 5 gallons material per 100 sq. ft.

B. Cover all corners and work thoroughly into all joints, cracks, or crevices. Finished coating shall be monolithic and free of pin holes or cracks. Seal cracks, voids and joints at dissimilar materials with glass fabric embedded in dampproofing coating.

C. Seal around penetrations including all masonry anchors.

D. Dampproofing shall be applied only when temperature is at 50 degrees F. and rising or above, and when no rain is forecast for the 24 hour period following application. No dampproofing shall be covered by masonry prior to observation by the Architect. All dampproofing shall dry for a minimum of 24 hours prior to being covered by finish masonry.

3.5 BELOW GRADE WATERPROOFING

A. LIQUID MEMBRANE:
   1. Install liquid membrane systems at earth side of all below grade walls, between sub-slab ("mud-slab") and structural slab, and all outside surfaces of elevator pit. Allow concrete work to cure a minimum of 14 days. All surfaces shall be smooth, dry, sound and free of honeycombs. Concrete shall be free of curing and parting compounds, wax or other foreign materials.
   2. Static joints or cracks less than 1/8" wide shall be sealed with "HLM" as manufactured by waterproofing manufacturer. Material shall fill and over-lap the edges of the joint to a width of 4" on both sides and shall have a minimum surface thickness of 55 (+5) mils.
   3. Immediately prior to application of membrane, remove all dust and dirt by use of high-pressure air, by brushing with a soft broom or vacuum cleaning.
   4. Apply material at a rate of 4 gallons per 100 square feet of surface to produce a membrane of 55 (+5) mil thick. Carefully control application to avoid runs and sags of fresh material.
   5. Apply membrane to prestripped areas at cracks, joints, intersections, penetrations, etc., to provide a minimum total thickness of 110 mils over these areas. Mask any membrane edge exposed to view to provide a straight clean edge.
   6. Before the membrane attains a final set, verify the applied thickness by use of a mil-thickness gauge. Where readings indicate a thickness less than specified, immediately apply additional membrane to produce required thickness.
   7. Following the application of the membrane, place protection boards over the membrane waterproofing at walls receiving backfill. Use membrane material as required to adhere protection boards. Boards shall be firmly in place with joints closely butted and sealed with gusset tape before backfilling is started.
   8. Protect membrane during construction. Any punctures or cuts in the membrane shall be patched and sealed in the manner described above for sealing joints in the sheeting.

3.6 SHOWER PANS

1. Ensure that surfaces receiving shower pan are clean, thoroughly dry and free from rough surfaces and sharp projections.
2. One-ply of 30 mil sheet shall be applied over concrete surface by embedding it in a coat of Nerva-Plast mastic trowel-applied at a rate of 40 sq. ft. per gallon. Turn up perimeter a minimum of 4".
3. Seal joints with 3" and final 2" wide strips of Nervastral tape in accordance with manufacturer's recommendations. Preform all corners and make without joints.
4. Roll entire horizontal area with 50 to 100 lb. Roller. Set corners and turn-ups with rubber roller.

END OF SECTION

SECTION 07 21 00 - BUILDING INSULATION

PART 1 - GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 SUMMARY

A. This Section includes the following:

1. Polystyrene foam insulation
2. Open cell spray foam insulation
3. Chicken Wire
4. Fiberglass roll or batt insulation
5. Polyencapsulated Batt Insulation
6. Fiberboard ceiling insulation underlayment

B. Related Sections include the following:

1. Section 09 21 16.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: Full-size units for each type of exposed insulation indicated.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.

D. Research/Evaluation Reports: For foam-plastic insulation.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

1.4 DELIVERY, STORAGE AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Extruded-Polystyrene Board Insulation:

a. DiversiFoam Products.
b. Dow Chemical Company.
c. Owens Corning.
d. Tenneco Building Products.

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively:

1. Type X, 1.30 lb/cu. ft.

C. Open Cell Spray Foam Insulation:
1. Icynene LD-R-50
2. Demilec Sealection 500
3. Application: Exterior Walls and other locations as indicated on plans.

D. Polyencapsulated Batt Insulation

1. Johns Manville
2. Owens Corning
3. Certainteed

Encapsulated, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).

1. Roof/Ceiling Cavity: R-19
2. Exterior Walls: R-19

E. Batt or Roll Insulation:

1. Johns Manville
2. Owens Corning
3. Certainteed

General: Insulation shall be fine fiber, flexible, resilient glass fiber blanket. Moisture absorption shall be less than .2% by volume.

1. Interior Stud Walls: 3 5/8" x 16" wide x 96" sound attenuation batts "R" factor 11. Unfaced.
2. Interior Stud Walls: 6" x 16" wide x 96" sound attenuation batts "R" factor 19. Unfaced
3. Above Acoustical Ceilings: 6" x 24" wide x 96" thermal batt insulation kraft faced fiberglass. "R" factor 19

AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

B. Chicken Wire: Provide as support for encapsulated batt insulation attached to the underside of metal building roof z girts.

C. Fiberboard ceiling insulation underlayment: Provide over scheduled ceilings as substrate to apply sprayed foam insulation. Provide Celotex or equivalent product.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Review and insure chemical compatibility of cavity wall dampproofing membrane and cavity rigid insulation board prior to installation.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

B. Close off openings in cavities receiving poured-in-place insulation to prevent escape of insulation. Provide bronze or stainless steel screens (inside) where openings must be maintained for drainage or ventilation.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturers written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are required to make up total thickness.

3.4 INSTALLATION OF FOAM INSULATION

A. Per manufacturer’s instructions. Installation by approved applicator only.

3.5 INSTALLATION OF CAVITY WALL INSULATION

A. On units of plastic insulation, install small pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, as recommended by manufacturer. Fit courses of insulation between confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against sheathing.

3.6 INSTALLATION OF POLYENCAPSULATED BATTS

A. Encapsulated batts at vertical wall surfaces are to be attached with self tapping screws where attached at z girts. Batts at metal stud wall shall form fit to cavity.

3.7 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Set vapor-retarder-faced units with vapor retarder to warm side of construction. Do not obstruct ventilation spaces, except for firestopping.

1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

C. Apply spray foam insulation in strict compliance with insulation manufacturers' written recommendations by manufacturer approved applicator only. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make it even with studs by using method recommended by insulation manufacturer.

END OF SECTION

SECTION 07 25 00 - WEATHER BARRIERS

PART 1 – GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 SECTION INCLUDES

A. Weather barrier membrane
B. Seam Tape
C. Flashing
D. Fasteners

1.2 REFERENCES

A. ASTM International
   1. ASTM C920; Standard Specification for Elastomeric Joint Sealants
   2. ASTM C1193; Standard Guide for Use of Joint Sealants
   3. ASTM D882; Test Method for Tensile Properties of Thin Plastic Sheeting
   4. ASTM D1117; Standard Guide for Evaluating Non-woven Fabrics
   5. ASTM E84; Test Method for Surface Burning Characteristics of Building Materials
   6. ASTM E96; Test Method for Water Vapor Transmission of Materials
   7. ASTM E1677; Specification for Air Retarder Material or System for Framed Building Walls
   8. ASTM E2178; Test Method for Air Permeance of Building Materials
B. AATCC – American Association of Textile Chemists and Colorists
   1. Test Method 127 Water Resistance: Hydrostatic Pressure Test
C. TAPPI
   1. Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area)
   2. Test Method T-460; Air Resistance (Gurley Hill Method)

1.3 SUBMITTALS

A. Refer to Section 01 33 00 Submittal Procedures.
B. Product Data: Submit manufacturer current technical literature for each component.
C. Samples: Weather Barrier Membrane, minimum 8-1/2 inches by 11 inch.
D. Quality Assurance Submittals

1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
2. Manufacturer Instructions: Provide manufacturer's written installation instructions.
3. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier assembly installation.

E. Closeout Submittals
1. Weather Barrier Warranty: Manufacturer's executed warranty form with authorized signatures and endorsements indicating date of Substantial Completion.

1.4 QUALITY ASSURANCE

A. Qualifications
1. Installer shall have experience with installation of weather barrier assemblies under similar conditions.
2. Installation shall be in accordance with weather barrier manufacturer's installation guidelines and recommendations.
3. Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.

B. Mock-up
1. Install mock-up using approved weather barrier assembly including fasteners, flashing, tape and related accessories per manufacturer's current printed instructions and recommendations.
   a. Mock-up size: 10 feet by 10 feet.
   b. Mock-up Substrate: Match wall assembly construction, including window opening.
   c. Mock-up may not remain as part of the work.
2. Contact manufacturer's designated representative prior to weather barrier assembly installation, to perform required mock-up visual inspection and analysis as required for warranty.

C. Pre-installation Meeting
1. Hold a pre-installation conference, two weeks prior to start of weather barrier installation. Attendees shall include Contractor, Architect, Engineer, Consultant, Installer, Owner's Representative, and Weather Barrier Manufacturer's Designated Representative.
2. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier assembly materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.

1.5 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 01 60 00 Product Requirements.
B. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
C. Store weather barrier materials as recommended by weather barrier manufacturer.

1.6 SCHEDULING

A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.
B. Schedule installation of weather barrier materials and exterior cladding within nine months of weather barrier assembly installation.

1.7 WARRANTY

A. Refer to Section 01 78 36 Warranties.
B. Special Warranty
   1. Special weather-barrier manufacturer's warranty for weather barrier assembly for a period of ten (10) years from date of final weather barrier installation.
   2. Approval by weather barrier manufacturer for warranty is required prior to assembly installation.
   3. Warranty Areas: [Describe specific areas of work protected and areas of work excluded as required by project conditions].

PART 2 - PRODUCTS

2.1 WEATHER BARRIER

A. A non-perforated, nonwoven, non-absorbing, breathable membrane that resists air flow, bulk water and wind driven rain and channels water and moisture to the outside of the building envelope. It has microscopic pores that allow moisture vapor to escape from inside walls.
B. Physical Properties
   1. Spunbonded polyolefin membrane.
C. Performance Characteristics:
   1. Air Penetration: 0.001 cfm/ft^2 at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677.
   2. Water Vapor Transmission: 28 perms, when tested in accordance with ASTM E96, Method B.
   3. Water Penetration Resistance: Minimum 280 cm when tested in accordance with AATCC Test Method 127.
   4. Basis Weight: Minimum 2.7 oz/yd^2, when tested in accordance with TAPPI Test Method T-410.
   5. Air Resistance: Air infiltration at >1500 seconds, when tested in accordance with TAPPI Test Method T-460.
   6. Tensile Strength: Minimum 38/35 lbs/in., when tested in accordance with ASTM D882, Method A.
   7. Tear Resistance: 12/10 lbs., when tested in accordance with ASTM D1117.
   8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 10, Smoke Developed: 10.

2.2 ACCESSORIES

A. Seam Tape: As recommended by the weather barrier manufacturer.
B. Fasteners:

   1. Steel Frame Construction
      1-5/8 inch rust resistant screw with 2-inch diameter plastic cap or manufacturer approved 1-1/4" or 2" metal gasketed washer

   2. Wood Frame Construction
      Nail Caps: #4 nails with large 1-inch plastic cap fasteners.

   3. Masonry Construction
      Masonry tap-con fasteners with Caps: 2-inch diameter plastic cap fasteners.

C. Sealants

1. Provide sealants that comply with ASTM C920, elastomeric polymer sealant to maintain watertight conditions.
2. Products: Sealants recommended by the weather barrier manufacturer.

D. Adhesives:
1. Provide adhesive recommended by weather barrier manufacturer.
2. Products: Adhesives recommend by the weather barrier manufacturer.

E. Primers:
1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.
2. Products: Primers recommended by the flashing manufacturer.

F. Flashing
1. Flexible membrane flashing materials for window openings and penetrations recommended by manufacturer.

2. Straight flashing membrane materials for flashing windows and doors and sealing penetrations such as masonry ties, etc. recommended by manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.2 INSTALLATION – WEATHER BARRIER

A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.
B. Install weather barrier prior to installation of windows and doors.
C. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.
D. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers. Maintain weather barrier plumb and level.
E. Sill Plate Interface: Extend lower edge of weather barrier over sill plate interface 3-6 inches. Secure to foundation with elastomeric sealant as recommended by weather barrier manufacturer.
F. Window and Door Openings: Extend weather barrier completely over openings.
G. Overlap weather barrier
1. Exterior corners: minimum 12 inches.
2. Seams: minimum 6 inches.
H. Weather Barrier Attachment:

1. Steel or Wood Frame Construction: Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommend fasteners, space 12-18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.

2. Masonry Construction: Attach weather barrier to masonry. Secure using weather barrier manufacturer

recommend fasteners, space 12-18 inches vertically on center and 24 inches maximum horizontally. Weather barrier may be temporarily attached to masonry using recommended adhesive, placed in vertical strips spaced 24 inches on center, when coordinated on the project site.

I. Apply flashing to weather barrier membrane prior to installing cladding anchors.

3.3 SEAMING

A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.
B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.4 OPENING PREPARATION (for use with non-flanged windows - all cladding types)

A. Flush cut weather barrier at edge of sheathing around full perimeter of opening.
B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.5 FLASHING (for use with non-flanged windows - all cladding types)

A. Cut flexible flashing a minimum of 12 inches longer than width of sill rough opening.
B. Cover horizontal sill by aligning flexible flashing edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.
C. Fan flexible flashing at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.
D. Apply 9-inch wide strips of flashing at jambs. Align flashing with interior edge of jamb framing. Start flashing at head of opening and lap sill flashing down to the sill.
E. Spray-apply primer to top 6 inches of jambs and exposed sheathing.
F. Install flexible flashing at opening head using same installation procedures used at sill. Overlap jamb flashing a minimum of 2 inches.
G. Coordinate flashing with window installation.
H. On exterior, install backer-rod in joint between window frame and flashed rough framing. Apply sealant at jambs and head, leaving sill unsealed. Apply sealants in accordance with sealant manufacturer’s instructions and ASTM C1193.
I. Position weather barrier head flap across head flashing. Adhere using flashing over the 45-degree seams.
J. Tape top of window in accordance with manufacturer recommendations.
K. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer’s instructions and ASTM C1193.

3.6 OPENING PREPARATION (for use with flanged windows)

A. Cut weather barrier in a modified “I-cut” pattern.
    1. Cut weather barrier horizontally along the bottom of the header.
    2. Cut weather barrier vertically 2/3 of the way down from top center of window opening.
    3. Cut weather barrier diagonally from bottom of center vertical cut to the left and right corners of the opening.
    4. Fold side and bottom weather barrier flaps into window opening and fasten.
B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.7 FLASHING (for use with flanged windows)

A. Cut flexible flashing a minimum of 12 inches longer than width of sill rough opening.
B. Cover horizontal sill by aligning flexible flashing edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.
C. Fan flexible flashing at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.
D. On exterior, apply continuous bead of sealant to wall or backside of window mounting flange across jambs and head. Do not apply sealant across sill.
E. Install window according to manufacturer's instructions.
F. Apply strips of flashing at jambs overlapping entire mounting flange. Extend jamb flashing 1-inch above top of rough opening and below bottom edge of sill flashing.
G. Apply strip of flashing as head flashing overlapping the mounting flange. Head flashing should extend beyond outside edges of both jamb flashings.
H. Position weather barrier head flap across head flashing. Adhere flashing over the 45-degree seams.
I. Tape head flap in accordance with manufacturer recommendations.
J. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C 1193.

3.8 FIELD QUALITY CONTROL

A. Notify manufacturer's designated representative to obtain required periodic observations of weather barrier assembly installation.

3.9 PROTECTION

A. Protect installed weather barrier from damage.

END OF SECTION

SECTION 07 26 16 - UNDER-SLAB VAPOR BARRIER

PART 1 – GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 SUMMARY

A. Products supplied under this section:
   1. Vapor barrier and installation accessories for installation under concrete slabs.

B. Related sections:
   1. Section 03 30 00 Cast-in-Place Concrete
   2. Section 07 26 00 Vapor Retarders

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E1745- 11Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
   2. ASTM E1643- 11Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

B. Technical Reference - American Concrete Institute (ACI):
   1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.3 SUBMITTALS

A. Quality control/assurance:
   1. Summary of test results per paragraph 9.3 of ASTM E 1745.
   2. Manufacturer’s samples and literature.
   3. Manufacturer’s installation instructions for placement, seaming and penetration repair instructions.
   4. All mandatory ASTM E1745 testing must be performed on a single production roll per ASTM E1745 Section 8.1.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Vapor barrier shall have all of the following qualities:
1. Maintain permeance of less than 0.01 Perms [grains/(ft^2 · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
2. Other performance criteria:
a. Strength: ASTM E1745 Class A.
b. Thickness: 15 mils minimum

B. Vapor barrier products:
1. Basis of Design: Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC., (877) 464-7834 www.stegoindustries.com.

2. Substitutions will be in accordance with Section 01 25 00.

2.2 ACCESSORIES

A. Seams :
1. Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

B. Penetrations of Vapor barrier:
1. Stego Mastic by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
2. Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

C. Perimeter/edge seal:
1. Stego Crete Claw by Stego Industries LLC, (887) 464-7834 www.stegoindustries.com.
2. Stego Term Bar by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
3. StegoTack Tape (double sided) by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

PART 3 – EXECUTION

3.1 PREPARATION

A. Ensure that subsoil is approved by Architect or Geotechnical Engineer.
1. Level and compact base material.

3.2 INSTALLATION

A. Install vapor barrier in accordance ASTM E1643.
1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
2. Extend vapor barrier over footings and grade beams to a distance acceptable to the structural engineer or stop at impediments such as dowels and waterstops.
3a. Seal vapor barrier to slab perimeter/edge using Stego Crete Claw and remove dirt, debris, and mud from Crete Claw prior to concrete placement.
OR
3b. Seal vapor barrier to footing/grade beam with double sided tape, termination bar, or both.
4. Overlap joints 6 inches and seal with manufacturer’s tape.
5. Apply tape/Crete Claw to a clean and dry vapor barrier.
6. Seal all penetrations (including pipes) per manufacturer’s instructions.

7. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
8. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all sides with tape.

END OF SECTION

SECTION 07 46 46 – FIBER CEMENT SIDING

PART 1 GENERAL

1.0 COORDINATION

1. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

2. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

3. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

4. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 SECTION INCLUDES

A. Fiber cement siding panels, fascia, moulding and accessories.

1.2 RELATED SECTIONS

A. Section 05400 – Light Gage Metal Framing: Wall framing and bracing.

B. Section 06100 – Rough Carpentry: Wood framing and bracing.

C. Section 06100 – Rough Carpentry: Sheathing.

D. Section 07210 – Insulation: Exterior wall insulation.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Provide detailed drawings of atypical non-standard applications of cementitious siding materials which are outside the scope of the standard details and specifications provided by the manufacturer.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 4 by 6 inches (100 by 150 mm), representing actual product, color, and patterns.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Minimum of 2 years experience with installation of similar products.

B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 WARRANTY

A. Product Warranty: Limited product warranty against manufacturing defects.
   1. Hardieplank lap and Hardipanel vertical siding for 50 years.
   2. Hardie Shingleside for 30 years.
   3. HardieTrim for 10 years.

B. Finish Warranty: Limited product warranty against manufacturing finish defects.
   1. When used for its intended purpose, properly installed and maintained according to Hardie's published installation instructions, James Hardie’s ColorPlus finish with ColorPlus Technology, for a period of 15 years from the date of purchase: will not peel; will not crack; and will not chip.

C. Workmanship Warranty: Application limited warranty for 2 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: James Hardie Building Products, Inc; 26300 La Alameda, Suite 250, Mission Viejo, CA 92691. ASD. Toll Free Residential: (888) J-HARDIE. Toll Free Commercial: (866) 274-3464. Tel: (949) 348-1800. Fax: (949) 367-0185. Email: info@JamesHardie.com. Web - Residential: http://www.jameshardie.com. Web - Commercial: http://www.jameshardiecommercial.com.

B. Substitutions: Not permitted.

C. Requests for approval of equal substitutions will be considered in accordance with provisions of Section 01 25 00.

2.2 SIDING

A. Code Compliance Requirement for Materials:
1. National Evaluation Report No. NER 405 (BOCA, ICBO, SBCCI)
2. US Department of Housing and Urban Development Materials Release 1263d
3. Non-asbestos fiber-cement siding where required to be non-combustible shall be tested in accordance with ASTM E136.

B. Lap Siding: Hardieplank as manufactured by James Hardie Building Products, Inc.
1. Type: Smooth 5-1/4 inches (133 mm) with 4 inches (102 mm) exposure.
2. Type: Smooth 6-1/4 inches (159 mm) with 5 inches (127 mm) exposure.
3. Type: Smooth 8-1/4 inches (210 mm) with 7 inches (178 mm) exposure.
4. Type: Smooth 9-1/2 inches (241 mm) with 8-1/4 inches (210 mm) exposure.
5. Type: Smooth 12 inches (305 mm) with 10-3/4 inches (273 mm) exposure.
6. Type: Cedarmill 5-1/4 inches (133 mm) with 4 inches (102 mm) exposure.
7. Type: Cedarmill 6 inches (152 mm) with 5 inches (127 mm) exposure.
8. Type: Cedarmill 8-1/4 inches (210 mm) with 7 inches (178 mm) exposure.
9. Type: Cedarmill 9-1/2 inches (241 mm) with 8-1/4 inches (210 mm) exposure.
10. Type: Cedarmill 12 inches (305 mm) with 1 10-3/4 inches (273 mm) exposure.
11. Type: Cedarmill Select 5 inches (127 mm) with 4 inches (102 mm) exposure.
12. Type: Cedarmill Select 6-1/4 inches (159 mm) with 5 inches (127 mm) exposure.
13. Type: Cedarmill Select 8-1/4 inches (210 mm) with 7 inches (178 mm) exposure.
14. Type: Cedarmill Select 9-1/2 inches (241 mm) with 8-1/4 inches (210 mm) exposure.
15. Type: Cedarmill Select 12 inches (305 mm) with 10-3/4 inches (273 mm) exposure.
16. Type: Smooth Beaded 8-1/4 inches (210 mm) with 7 inches (178 mm) exposure.
17. Type: Cedarmill Beaded 8-1/4 inches (210 mm) with 7 inches (178 mm) exposure.
18. Type: Colonial Smooth 8 inches (203 mm) with 6-3/4 inches (171 mm) exposure.
19. Type: Colonial Roughsawn 8 inches (203 mm) with 6-3/4 inches (171 mm) exposure.

C. Vertical Siding: Hardiepanel as manufactured by James Hardie Building Products, Inc.
1. Type: Smooth Vertical siding panel 4 feet by 8 feet (1219 mm by 2438 mm).
2. Type: Smooth Vertical siding panel 4 feet by 9 feet (1219 mm by 2743 mm).
3. Type: Smooth Vertical siding panel 4 feet by 10 feet (1219 mm by 3048 mm).
4. Type: Stucco Vertical siding pane! 4 feet by 8 feet (1219 mm by 2438 mm).
5. Type: Stucco Vertical siding panel 4 feet by 9 feet (1219 mm by 2743 mm).
6. Type: Stucco Vertical siding panel 4 feet by 10 feet (1219 mm by 3048 mm).
7. Type: Sierra 4 inches (102 mm) Vertical siding panel 4 feet by 8 feet (1219 mm by 2438 mm).
8. Type: Sierra 4 inches (102 mm) Vertical siding panel 4 feet by 9 feet (1219 mm by 2743 mm).
9. Type: Sierra 4 inches (102 mm) Vertical siding panel 4 feet by 10 feet (1219 mm by 3048 mm).
10. Type: Sierra 8 inches (203 mm) Vertical siding panel 4 feet by 8 feet (1219 mm by 2438 mm).
11. Type: Sierra 8 inches (203 mm) Vertical siding panel 4 feet by 9 feet (1219 mm by 2743 mm).
12. Type: Sierra 8 inches (203 mm) Vertical siding panel 4 feet by 10 feet (1219 mm by 3048 mm).

D. Shingle Siding: Hardie Shingleside Cladding as manufactured by James Hardie Building Products, Inc.
1. Type: Shingleside 6 inches (152 mm) width with 8 inches (203 mm) exposure.
2. Type: Shingleside 8 inches (203 mm) width with 8 inches (203 mm) exposure.

3. Type: Shingleside 12 inches (305 mm) width with 8 inches (203 mm) exposure.

E. Trim: Hardietrim Fascia and Moulding as manufactured by James Hardie Building Products, Inc.

F. Hardie Soffit: HardieSoffit panels as manufactured by James Hardie Building Products, Inc.
1. Type: Vented Smooth & Cedarmill panel 12 inches by 12 feet
2. Type: Vented Smooth & Cedarmill panel 16 inches by 12 feet
3. Type: Vented Smooth & Cedarmill panel 24 inches by 8 feet
4. Type: Non-Vented Smooth & Cedarmill panel 12 inches by 12 feet
5. Type: Non-Vented Smooth & Cedarmill panel 16 inches by 12 feet
6. Type: Non-Vented Smooth & Cedarmill panel 24 inches by 8 feet
7. Type: Non-Vented Smooth & Cedarmill panel 48 inches by 8 feet (Only available primed)

2.3 FASTENERS

A. Wood Framing Fasteners:
1. Wood framing: 4d common corrosion resistant nails.
2. Wood framing: 6d common corrosion resistant nails.
3. Wood framing: 0.089 inch (2.2 mm) shank by 0.221 inch (5.6 mm) head by 2 inches (51 mm) corrosion resistant siding nails.
4. Wood framing: 0.093 inch (2.4 mm) shank by 0.222 inch (5.6 mm) head by 2 inches (51 mm) corrosion resistant siding nails.
5. Wood framing: 0.091 inch (2.3 mm) shank by 0.221 inch (5.6 mm) head by I-1/2 inches (38 mm) corrosion resistant siding nails.
6. Wood framing: 0.091 inch (2.3 mm) shank by 0.225 inch (5.7 mm) head by 1-1/2 inches (38 mm) corrosion resistant siding nails.
7. Wood framing: 0.121 inch (3 mm) shank by 0.371 inch (9.4 mm) head by 1-1/4 inches (32 mm) corrosion resistant roofing nails.
8. Wood framing: 1-1/4 inches (32 mm) corrosion resistant roofing nails.
9. Wood framing: 1-1/2 inches (38 mm) corrosion resistant roofing nails.

B. Metal Framing:
1. Metal framing: 1-1/4 inches (32 mm) No. 8-18 by 0.375 inch (9.5 mm) head self-drilling, corrosion resistant S-12 ribbed buglehead screws.
2. Metal framing: 1-5/8 inches (41 mm) No. 8-18 by 0.323 inch (8.2 mm) head self-drilling, corrosion resistant S-12 ribbed buglehead screws.
3. Metal framing: 1 inch (25 mm) No. 8-18 by 0.323 inch (8.2 mm) head self-drilling, corrosion resistant ribbed buglehead screws.
4. Metal framing: 1 inch (25 mm) No. 8-18 by 0.311 inch (7.9 mm) head self-drilling, corrosion resistant S-12 ribbed buglehead screws.
5. Metal framing: 1.5 inch (38mm) [AGS-100] .100 inches by 25 inches (2540 mm by 635 mm) ET&F Pin or equivalent pneumatic fastener.
6. Concrete Walls: Erica Stud Nail, ET&F ASM No.-144-125, 0.14 inch (3.6 mm) shank by 0.30 inch (7.6 mm) head by 2 inches (51 mm) corrosion resistant nail.

2.4 FINISHES

A. Factory Primer: Provide factory applied universal primer.
1. Primer: PrimePlus by James Hardie.
2. Topcoat: Refer to Section 09900 and Exterior Finish Schedule.

B. Factory Finish: Refer to Exterior Finish Schedule.
1. Product: ColorPlus by James Hardie.

C. Factory Finish Color for Trim, Soffit and Siding Colors:

1.	Alpine Frost	JH50-10
2.	Arctic White	JH10-20
3.	Autumn Tan	JH20-20
4.	Boothbay Blue	JH70-20
5.	Chestnut Brown	JH80-30
6.	Cobble Stone	JH40-10
7.	Countrylane Red	JH90-20
8.	Evening Blue	JH70-30
9.	Frosted Green	JH60-20
10.	Harris Cream	JH80-10
11.	Heathered Moss	JH50-20
12.	Iron Gray	JH90-30
13.	Khaki Brown	JH20-30
14.	Light Mist	JH70-10
15.	Monterey Taupe	JH40-20
16.	Mountain Sage	JH50-30
17.	Navajo Beige	JH30-10
18.	Parkside Pine	JH60-30
19.	Sail Cloth	JH20-10
20.	Sandstone Beige	JH30-20
21.	Soft Green	JH60-10
22.	Timber Bark	JH40-30
23.	Traditional Red	JH90-10
24.	Tuscan Gold	JH80-20
25.	Woodland Cream	JH10-30
26.	Woodstock Brown	JH30-30

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If framing preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Nominal 2 inch by 4 inch (51 m by 102 mm) wood framing selected for minimal shrinkage and complying with local building codes, including the use of water-resistive barriers or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.
1. Install water-resistive barriers and claddings to dry surfaces.
2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
3. Protect siding from other trades.

D. Minimum 20 gauge 3-5/8 inch (92 mm) C-Stud 16 inches maximum on center or 16 gauge 3-5/8 inches (92 mm) C-Stud 24 inches (610 mm) maximum on center metal framing complying with local building codes, including the use of water-resistive barriers and/or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.
1. Install water-resistive barriers and claddings to dry surfaces.
2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
3. Protect siding from other trades.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION - HARDIEPLANK SIDING

A. Install materials in strict accordance with manufacturer's installation instructions.

B. Starting: Install a minimum 1/4 inch (6 mm) thick lath starter strip at the bottom course of the wall. Apply planks horizontally with minimum 1-1/4 inches (32 mm) wide laps at the top. The bottom edge of the first plank overlaps the starter strip.

C. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer’s installation instructions.

D. Align vertical joints of the planks over framing members.

E. Maintain clearance between siding and adjacent finished grade.

F. Locate splices at least one stud cavity away from window and door openings.

G. Use off-stud metal joiner in strict accordance with manufacturer’s installation instructions.

H. Wind Resistance: Where a specified level of wind resistance is required Hardieplank lap siding is installed to framing members and secured with fasteners described in Table No. 2 in National Evaluation Service Report No. NER-405.

C. Face nail to sheathing.

D. Locate splices at least 12 inches (305 mm) away from window and door openings.

E. Wind Resistance: Where a specified level of wind resistance Is required Hardieplank lap siding is installed to framing members and secured with fasteners described in Table No. 2 in National Evaluation Service Report No. NER-405.

3.4 INSTALLATION - HARDIEPANEL SIDING

A. Install materials in strict accordance with manufacturer's installation instructions.

B. Block framing between studs where Hardiepanel siding horizontal joints occur.

C. Place fasteners no closer than 3/8 inch (9.5 mm) from panel edges and 2 inches (51 mm) from panel corners.

D. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer’s installation instructions.

E. Maintain clearance between siding and adjacent finished grade.

F. Specific framing and fastener requirements refer to Tables 2 and 3 in National Evaluation Service Report No. NER-405.

3.5 INSTALLATION – HARDIE SHINGLESIDE CLADDING

A. Install materials in strict accordance with manufacturer's installation instructions.

B. Substrate: Install a minimum 7/16 inch (11 mm) thick OSB wall sheathing or equivalent braced walls complying with applicable building codes.

C. Starting: Install a minimum 1/4 inch (6 mm) thick lath starter strip at the bottom course of the wall.

D. Maintain clearance between siding and adjacent finished grade.

E. Apply starter course of 10 inches (254 mm) shingles or 9-1/2 inches (241 mm) lap siding overlapping the starter strip.

F. Apply subsequent courses horizontally with a minimum 10 inch overlap at the top and a minimum 2 inch (51 mm) side lap. The bottom edge of the first two courses overlaps the starter strip.

G. Fasten between 1/2 inch (13 mm) and 1 inch (25 mm) in from the side edge and between 8-1/2 inches (216 mm) and 9 inches (229 mm) up from the shingle bottom edge.

H. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer’s installation instructions.

I. Ensure vertical joints of overlapping shingle course do not align.

J. Wind Resistance: Where a specified level of wind resistance is required Hardie Shingleside cladding is installed to substrate and secured with a minimum two fasteners described in Table No. 6, 7 and 8 in National Evaluation Service Report No. NER-405.

3.6 INSTALLATION - HARDIETRIM FASCIA AND MOULDING

A. Install materials in strict accordance with manufacturer's installation instructions. Install flashing around all wall openings.

B. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch (19 mm) or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.

C. Place fasteners no closer than 3/4 inch (19 mm) and no further than 2 inches (51 mm) from side edge of trim board and no closer than 1 inch (25 mm) from end. Fasten maximum 16 inches (406 mm) on center.

D. Maintain clearance between trim and adjacent finished grade.

E. Trim inside corner with single board.

F. Outside Corner Board: For 3/4 inch (19 mm) trim only. Install single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten Hardietrim board to Hardietrim board.

G. Outside Corner Board: For 1 inch (25 mm) and 1-1/2 inches (38 mm) trim only. Pre Build corners by fastening trim together with 16 ga. corrosion resistant finish nail 1/2 inch (13 mm) from edge spaced 16 inches (406 mm) apart, weather cut each end spaced minimum 12 inches (305 mm) apart.

H. Allow 1/8 inch gap between trim and siding.

I. Seal gap with high quality, paint-able caulk.

J. Shim frieze board as required to align with corner trim.

K. Install Hardietrim fascia over structural subfascia.

L. Overlay siding with Hardietrim moulding at windows, doors and inside corners.

M. Fasten through overlapping boards. Do not nail between lap joints.

N. Overlay siding with single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten Hardietrim boards to Hardietrim boards.

O. Shim frieze board as required to align with corner trim.

P. Install Hardietrim fascia over structural subfascia.

3.7 FINISHING

A. Finish unprimed siding with a minimum one coat high quality, alkali resistant primer and one coat of either, 100 percent acrylic or latex or oil based, exterior grade topcoats or two coats high quality alkali resistant 100 percent acrylic or latex, exterior grade topcoat within 90 days of installation. Follow paint manufacturer’s written product recommendation and written application instructions.

B. Finish factory primed siding with a minimum of one coat of high quality 100 percent acrylic or latex or oil based exterior grade paint within 180 days of installation. Follow paint manufacturer’s written product recommendation and written application instructions.

3.8 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 61 13 - NEW STANDING SEAM METAL ROOF SYSTEM

PART 1 – GENERAL

1.00 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.01 RELATED WORK

A. Section 07 41 00 – Roofing Panels

B. Section 07 53 00 - Coal-tar Elastomeric Roofing System

C. Section 07 60 00 - Sheet Metal and Miscellaneous Accessories

1.02 INSTALLER QUALIFICATIONS

A. Roofing installer must be:
1. Currently prequalified with the Owner in accordance with Owner's prequalification requirements.
2. Currently in good standing with the manufacturer.
3. Installer must be an experienced single firm specializing in the type of roofing repair and/or removal and replacement work required, employing only experienced workers for the class of work in which they are employed, having at least five (5) years successful experience on projects similar in size and scope and acceptable as applicators by the Owner's representative.
4. Contractor must have successfully completed previous projects warranted by the manufacturer.

B. It shall remain each Bidder's responsibility to determine his current status with the manufacturer's certification plan.

1.03 QUALITY ASSURANCE

A. Applicator/Installer:
1. Must be acceptable to roof material manufacturer for the manufacturer's warranty requirements.
2. Must be an experienced single firm specializing in the type of roofing repair and/or removal and replacement work required, employing only experienced workers for the class of work in which they are employed, having at least five (5) years successful experience on projects similar in size and scope and acceptable as applicators by the Owner's representative.

B. Testing Laboratory Services: Test results shall meet or exceed established standards.

C. Underwriters Laboratories, Inc.; Roofing Covering: Class A fire hazard classification.

D. Factory Mutual: Wind uplift requirements

1.04 REFERENCES (INCLUDING LATEST REVISIONS)

A. American Society for Testing and Materials:
1. ASTM A 792 Finish Application on Metal Wall Panels
2. ASTM B 209 - 90, Specification for Aluminum and Aluminum Alloy Sheet and Plate
3. ASTM C 719 - 86, Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cycle Movement (Hockman Cycle)
4. ASTM C 794 - 80 (1986), Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
5. ASTM C 920 - 87, Specification for Elastomeric Joint Sealants
6. ASTM A 361 - 90, Sheet Steel, Zinc-Coated (Galv.) by the Hot-Dip Process for Roofing and Siding
7. ASTM C 177, Test for Thermal Laboratory Services
8. ASTM C 728, Perlite Thermal Insulation Board
9. ASTM D 523 Reflective Finish on Metal Roof Panels

B. Federal Specifications:
1. LLL-I-535B
2. SS-A-701B
3. SS-C-153
4. SS-C-153C
5. SS-R-620B
6. TT-C-498C
7. TT-P-320D
8. TT-S-00227E
9. TT-S-00230C
10. SS-S-001534 (GSA-FSS)
11. L-P-375

C. Industry Standards:
1. The National Roofing Contractors Association (NRCA) - Roofing and Waterproofing Manual
2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA) - Architectural Sheet Metal Manual

1.05 SUBMITTALS

A. Samples and Manufacturer's Submittals: Submit prior to delivery or installation.
1. Samples of all roofing system components including all specified accessories.
2. Submit samples of proposed warranty complete with any addenda necessary to meet the warranty requirements as specified.
3. Submit latest edition of manufacturer's specifications and installation procedures. Submit only those items applicable to this project.
4. A written statement from the roofing materials manufacturer approving the installer, specifications and drawings as described and/or shown for this project and stating the intent to guarantee the completed project.

B. Shop Drawings: Provide manufacturer's approved details of all perimeter conditions, projection conditions, and any additional special job conditions which require details other than indicated in the drawings.

C. Maintenance Procedures: Within ten days of the date of Substantial Completion of the project, deliver to the Owner three copies of the manufacturer's printed instructions regarding care and maintenance of the roof.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original packaging with all labels intact and legible, including labels indicating storage conditions, lot numbers, and usage instructions. Materials damaged in shipping or storage shall not be used.

B. Manufacturer's packaging and/or roll plastic is not acceptable for exterior storage. Tarpaulin with grommets shall be minimum acceptable for exterior coverings. All materials stored as above shall be minimum of four inches (4") off the substrate, and the tarpaulin tied off with rope.

C. Deliver materials requiring fire resistance classification to the job with labels attached and packaged as required by labeling service.

D. Deliver materials in sufficient quantity to allow continuity of work.

E. Handle and store material and equipment in such a manner as to avoid damage. Liquid products shall be delivered sealed, in original containers.

F. Handle rolled goods so as to prevent damage to edge or ends.

G. Select and operate material handling equipment so as not to damage existing construction or applied roofing.

H. Moisture-sensitive products shall be maintained in dry storage areas and properly covered. Provide continuous protection of materials against wetting and moisture absorption. Store roofing and flashing materials on clean raised platforms with weather protective covering when stored outdoors.

I. Store rolled goods on end.

J. Protect materials against damage by construction traffic.

K. The proper storage of materials is the sole responsibility of the contractor and any wet or damaged roofing materials shall be discarded, removed from the project site, and replaced prior to application.

L. Comply with fire and safety regulations, especially with materials which are extremely flammable and/or toxic. Use safety precautions indicated on labels.

M. Products liable, such as emulsions, to degrade as a result of being frozen shall be maintained above 40° F in heated storage.

N. No storage of materials shall be permitted on roof areas other than those materials that are to be installed the same day. Any exception must be in written form.

1.07 SITE CONDITIONS

A. Job Condition Requirements:
   1. Apply roofing in dry weather.
   2. Do not apply roofing when ambient temperature is below 40° F (4° C).
   3. Proceed with roofing work only when weather conditions are in compliance with manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with specifications.

4. For further information regarding roofing material manufacturer's recommendations for project conditions, refer to the manufacturer's published application manual.
5. All surfaces to receive new roofing shall be smooth, dry, and free from dirt, debris, and foreign material before any of this work is installed. Competent operators shall be in attendance at all times equipment is in use. Materials shall be stored neatly in areas designated by the Owner. Load placed on the roof at any point shall not exceed the safe load for which the roof is designed.
6. The contractor shall take all necessary precautions to protect the roof mat and deck from damage. The contractor shall be responsible for repairing all new areas of damage caused by the negligence of the contractor, at the contractor's expense. The Owner's on-site representative shall determine damage caused by contractor negligence.
7. Follow insurance underwriter's requirements acceptable for use with specified products or systems.
8. All kettles shall have an automatic thermostat control, and temperature gauge, all in working order.
9. Surface and air temperatures should be a minimum 45° F during applications of cleaner and waterproof coating and remain above 45° F for a minimum of four (4) hours following applications. Verify compatibility of cleaner with coatings, paints, primers and joint sealers specified. Advise Owner's representative of any problems in this regard prior to commencing cleaning operations.
10. Temporary Sanitary Facilities: The contractor shall furnish and maintain temporary sanitary facilities for employees' use during this project. These will be removed after the completion of the project. All portable facilities shall comply with local laws, codes, and regulations.

B. Protection of Work and Property:
   1. Work: The contractor shall maintain adequate protection of all his work from damage and shall protect the Owner's and adjacent property from injury or loss arising from this contract. He shall provide and maintain at all times any OSHA required danger signs, guards, and/or obstructions necessary to protect the public and his workmen from any dangers inherent with or created by the work in progress. All federal, state, and city rules and requirements pertaining to safety and all EPA standards, OSHA standards, NESHAP regulations pertaining to asbestos as required shall be fulfilled by the contractor as part of his proposal.
   2. Twenty-four Hour Call: The contractor shall have personnel on call 24 hours per day, seven (7) days per week for emergencies during the course of a job. The Owner's project manager is to have the 24 hour numbers for the contact. Contractor must be able to respond to any emergency call and have personnel on-site within two (2) hours after contact. Numbers available to the Owner's project manager are to be both home and office numbers for:
      a) Job Foreman
      b) Job Superintendent
      c) Owner or Company Officer

C. Damage to Work of Others: The contractor shall repair, refinish, and make good any damage to the building or landscaping resulting from any of his operation. This shall include, but is not limited to, any damage to plaster, tile work, wall covering, paint, ceilings, floors, or any other finished work. Damage done to the building, equipment, or grounds must be repaired at the successful contractor's expense holding the Owner harmless from any other claims for property damage and/or personal injury.

D. Measurements: It will be the contractor's responsibility to obtain and/or verify any necessary dimensions by visiting the job site, and the contractor shall be responsible for the correctness of same. Any drawings supplied are for reference only.

E. Cleaning and Disposal of Materials:
   1. Contractor shall keep the job clean and free from all loose materials and foreign matter. Contractor shall take necessary precautions to keep outside walls clean and shall allow no roofing materials to remain on the outside walls.

2. All waste materials, rubbish, etc., shall be removed from the Owner's premises as accumulated. Rubbish shall be carefully handled to reduce the spread of dust. A suitable scrap chute or hoist must be used to lower any debris. At completion, all work areas shall be left broom clean and all contractor's equipment and materials removed from the site.
3. All bituminous or roofing related materials shall be removed from ladders, stairs, railings, and similar parts of the building.
4. Debris shall be deposited at an approved disposal site.

1.08 WARRANTY

A. Roofing - Manufacturer: Project shall be installed in such a manner that the material manufacturer will furnish a written twenty (20) year labor and materials watertight warranty from the date of substantial completion of the completed project.

B. Project shall be completed in such a manner that the material manufacturer shall furnish a standard twenty (20) year warranty on the product finish against oxidation failure.

C. Roofing - Contractor: The contractor, jointly with any subcontractors employed by him, shall guarantee the work required and performed under this contract will be free from defects in workmanship and materials, and that the building will be and remain waterproof for a two (2) year warranty period, after the Owner accepts the work as substantially complete. The warranty shall be in approved notarized written form, to obligate the contractor and his subcontractors, if any, to make good the requirements of the warranty.

D. Warranty repairs shall be performed by a certified installer. The repairs shall be performed in accordance with the manufacturer's written instructions and recommended procedures so as to not void the warranty. Repair of the system, including materials and labor, shall be done at no cost to the Owner.

E. During the proposal period each Bidder shall make arrangements with the material manufacturer to provide the required warranty. Refer to paragraph 1.05 SUBMITTALS in this section for requirements concerning submittals of warranty.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall be furnished, specified, or approved in writing by the manufacturer issuing the warranty.

B. Samples of all materials used on the project, which are not supplied by the membrane manufacturer, shall be submitted to the membrane manufacturer for written approval prior to work starting.

C. All materials used on the project shall be asbestos free.

2.02 FELTS

A. Shall be Underwriters Laboratory approved and listed in the FM Global Approval Guide.

2.03 UNDERLAYMENT MEMBRANE

A. Membrane shall be nominal sixty (60) mil in overall thickness consisting of forty-five (45) mil thick calendered coal-tar elastomeric membrane thickness with fifteen (15) mil thick backing of styrene butadiene styrene (SBS) adhesive with a selvage edge. The self-adhering membrane shall be a high-performance elastomeric membrane incorporating DuPont™ Elvaloy KEE (ketone ethylene ester), extended with coal-tar pitch and reinforced with polyester fibers.

B. The self-adhering membrane shall meet the following physical properties: Elongation 170%, ASTM D 412; Tensile Strength 1600 lbs/in^2, ASTM D 412; Tear Strength 300 ppi, ASTM D 624; Density @ 70° F, 80 lbs/ft^3; Low Temperature Flexibility, Pass, 37-GP-56M; and Water Absorption less than 0.1%, 37-GP-56M. Roll shall have one and one-half inch (1-1/2") wide dry lap for hot-air welding.

2.04 UNDERLAYMENT FLASHING MEMBRANE

A. Flashing shall be same base material as the finish ply self-adhered coal-tar elastomeric membrane (CTEM) and be installed using the design principles set forth in the National Roofing Contractors Association Manual and attached details.

2.05 END LAP MEMBRANES

A. Shall be a sixty (60) mil overall calendered thickness membrane. The membrane shall be a high performance elastomeric membrane incorporating a DuPont™ Elvaloy KEE (ketone ethylene ester), extended with coal-tar pitch and reinforced with polyester fibers.

B. End lap splice strip shall be the same type material as the finish ply membrane not to exceed nominal 60 mils in overall calendered thickness. Strips shall be nine inches (9") by forty-two inches (42") long. All four edges shall have a minimum one and one-half inch (1-1/2") wide dry lap for hot-air welding.

2.06 CAULKS

A. Sealant for use at coping joints, reglet joints, etc., shall be a one-component urethane non-sag, gun grade sealant designed for use in active exterior joints, and shall meet or exceed Federal Specification No. 1 TT-S-00230C, Type II, Class A, ASTM C 920. Where joint surfaces are contained or are contaminated with bituminous materials, provide manufacturer's modified-type sealant (modified with coal-tar or asphalt as required).

B. To seal the leading edge of the CTEM membrane, to bond CTEM at terminations with metal, and for open CTEM seam repair, sealant shall be a thermosetting, solvent free, non-slump, self-fixturing, multipurpose structural sealant which shall meet the following physical and performance properties.

Properties	
Specific Gravity	1.62 (13.5 lbs./gallon)
Viscosity	800,000 cps Brookfield RTV, TF spindle, 4 rpm 70 degrees F.
Shear Strength (ASTM D-1002)	300 psi+ (7 day ambient cure)
Elongation @ break (ASTM D-412)	300% (7 day ambient cure)
Hardness Shore A (ASTM C-661)	50 – 55 (14 day ambient cure)
Tack free time (ASTM C-679)	35 minutes
Low temperature flex	Minus 20 degrees F: PASS
Slump (sag) (ASTM C-639)	Zero slump
Shrinkage (ASTM D-2453)	No measurable shrinkage (14 cay cure)
Service temperature	-40 degrees F to 200 degrees F

2.07 PITCH PAN SEALANT

A. Shall be one-part, self-leveling polyurethane sealant meeting Federal Specification No. TT-S-00230C, Type I, Class A, ASTM C 920, Type S, Grade P, Class 25, for use in new pitch pans.

2.08 CANT STRIP

A. Shall be wood fiber where used for non-structural purposes. Shall be treated solid wood where used for structural purposes meeting NRCA, Factory Mutual and Underwriters Laboratory guidelines. If solid wood cant is used where insulation exists, cant is to be toe nailed into treated solid wood nailer the same height as insulation.

2.09 FASTENERS

A. Shall be Factory Mutual approved and as recommended by the manufacturer for the specific application.

B. Fastener for Brick: Shall be one-fourth inch by two inch (1/4" x 2"), zinc with plated steel or stainless steel nail, one piece unit, flat head.

C. Fastener for Wood Deck: Shall be a annular threaded shank with a galvanized round cap of appropriate length for use in attaching base sheets to wooden substrates.

D. Fastener for Miscellaneous Metal Roof Application: Shall be a #12 fastener, fluorocarbon coated, with CR-10 coating. A minimum .200 diameter shank and .250 diameter thread. To be used with round pressure plates or bar, and having a fluorocarbon CR-10 coating, when subjected to thirty (30) Kesternich cycles (DIN 50018) shows less than 10% red rust which surpasses Factory Mutual Approval Standard 4470. Fasteners, plates, and/or bars shall be listed in the Factory Mutual Approval Guide.

2.10 WOOD

A. All nailers, wooden cants and wooden curbs shall be treated lumber as required by NRCA, Factory Mutual and Underwriters Laboratory and installed according to NRCA and Factory Mutual guidelines.

2.11 ASPHALT ROOF PRIMER

A. Quick-dry asphalt-based primer for priming of asphalt roof surfaces.

Applicable Federal Specification	SS-A-701B
ASTM	D 41
Flash Point	105° F
Viscosity at 80° F (ASTM D 217)	50-60 K.U.
Weight per gallon	7.4 pounds
Drying time (to touch)	Min. 4 hours

2.12 STYRENE, BUTADIENE, STYRENE (SBS) PRIMER

A. SBS primer made from natural resins, solvent and synthetic rubber. For application on concrete, metal or wooden substrate.

2.13 ASPHALT FLASHING CEMENT

A. Designed for laying-up cold process roof membrane flashings where fast-setting adhesive is required.

Applicable Federal Specification	SS-C-153C, Type I
ASTM	D 4586
Flash Point	105° F (41° C)
Weight per gallon (approximate)	10.8 lbs.
Viscosity @ 77° F (25° C) (ASTM D 217)	230-330
% Non-Volatile (Fed. Test Method 141)	68% Min.
% Specially Processed Bitumen	42% Min.
% Total Solids, by Volume	60% Min.
Cured film thickness of 1 gal./15 sq. ft.	75 Mils
Drying time	2 to 3 days
Service Temperature, Extended Exposure	-40° to +180° F
Resistance to Oils & Solvents	Poor
Resistance to Sunlight	Good
Resistance to Chemicals	Good
Effects of Weathering	Slight chalking
Water Resistance	
Under Good Drainage Conditions	Excellent
Under Continuous Submersion	Fair

2.14 KRAFT SHEATHING PAPER

A. Minimum 28-pound kraft sheathing or red rosin paper for use as separator sheet.

2.15 STANDING SEAM ROOF PANELS

A. Panels:
1. Shall be prefinished Galvalume™ UL 90 rated, 24-gauge, eighteen inch (18") seam sheet made up of 55% aluminum, 1.6% silicon and the balance zinc as described in ASTM specification A792.
2. Factory fabricates panel with integral continuous interlocking standing seam without need for separate seam covers. **Field formed panels will not be acceptable**.
3. Sealant shall be high grade, hot-melt elastomeric sealant in top edge of female seam cap, designed to seal against adjacent male panel leg.
4. All held panels shall be continuous, no exceptions.
5. Panel Fabrication:
   a) Provide factory formed panel width of 18" with 1 3/4" high x 3/8" wide standing seam.
   b) Provide panels in full length from ridge to eave.
   c) Vertical striations (shadowline) to be furnished on all panels over sixteen inches (16") wide.
6. Seams:
   a) Panel cap shall have pitched bottom edge hook elements to ease installation of cap over clips.
   b) Provide factory sealant inside female seam to aid in resistance of leaks and to provide panel-to-panel seal while allowing expansion and contraction movement.
7. Seam Size:
   a) Male leg: 1 1/2" high
   b) Female cap: 1 3/4" high x 3/8" wide

B. Clip/Fastener Assemblies:
   1. UL 90 Requirements:
      a) Fasteners: Manufacturer's standard #10 – 16 x 1" long self-drilling, self-tapping pancake head Phillips drive screws for metal; noncorrosive base material.
   2. Standard Clip: 24-gauge galvanized steel, 33 ksi yield strength, and 2" long single fastener type.
   3. Standard Fasteners: Same as UL 90 fasteners specified above.
   4. Clips:
      a) Provide UL listed (standard) clip designated to allow panels to thermally expand and contract.
      b) Fabricate clips with embossments that raise underside of panels above substrate to allow underside ventilation and prevent clip deformation.
      c) Fabricate clips with structurally embossed outstanding legs to prevent distortion to wind uplift forces.
   5. Nailable Substrate Fasteners: #10 – 12 x 1" long A-Point fastener, pancake head Phillips drive screws for plywood; noncorrosive base material.

C. Accessories:
   1. Provide manufacturer's standard accessories and other items essential to completeness of standing seam roof installation.
   2. Provide nylon seam end plugs for clean termination of panel.
   3. Gutters and downspouts will be fabricated to the same gauge and specification as panel and match metal profile of the details herein.

D. Field Sealant:
   1. Color coordinated primerless silicone or high grade, nondrying butyl as recommended by panel manufacturer.
   2. Do not use sealant containing asphalt.

E. Engineer panels to use concealed anchors that permit expansion and contraction. Exposed fasteners in roofing panels will not be permitted.

F. Provide factory eave panel notch for eave termination (to be utilized with joggle cleat detail).

G. Panel Finish:
   1. Full strength 70% Kynar 500® coating baked on for 15 minutes at 450° F to dry-film thickness of 1.0 mil.
   2. 15% reflective gloss (ASTM D 523). (Low Gloss).
   3. 0.3 mil baked on epoxy primer.
   4. Standard Color: Galvalume finish.

2.16 LEAD JACKS

A. Shall be four pound (4#) lead, and of dimensions required to completely cover existing plumbing stack.

2.17 TERMINATION/PRESSURE BARS

A. Aluminum strip shall be extruded channel bar with a mill finish, width one inch (1"), thickness 0.100" ± .008", leg height one-fourth inch (1/4") top and bottom, leg angle ninety degrees (90°), for perimeter and curb anchorage, having predrilled holes six inches (6") on center, as manufactured by Olympic Fasteners, or approved equal.

2.18 DELIVERY AND STORAGE

A. All materials shall be delivered with appropriate carton and can labels indicating appropriate warnings, storage conditions, lot numbers, and usage instructions. Materials damaged in shipping or storage shall not be used.

2.19 PRECAUTIONS

A. Some of the indicated materials are extremely flammable and/or toxic. Use precautions indicated on can and carton labels.

2.20 MULTI-COMPONENT POLYURETHANE SEALANT

A. Except as otherwise indicated, provide manufacturer's standard, non-modified, 2-or-more-part, polyurethane-based, elastomeric sealant; complying with either ASTM C 920, Type M, Class 25, or FS TT-S-00227E, Class A; self-leveling grade/type where used in joints of surfaces subject to traffic, otherwise non-sag grade/type.

B. Durability: Less than 0.5 square inch adhesion/cohesion loss for three (3) samples of both mortar and aluminum; ASTM C 719 test procedure.

C. Adhesion in Peel: Fifteen pound (15#) peel strength and ten percent (10%) maximum loss of bond to substrate; ASTM C 794.

D. Bituminous Modification: Where joint surfaces contain or are contaminated with bituminous materials, provide manufacturer's modified type sealant which is compatible with joint surfaces (modified with coal-tar or asphalt as required).

2.21 EXPANDED POLYETHYLENE JOINT FILLER

A. Provide flexible, compressible, closed-cell, polyethylene of not less than 10 psi compression deflection (25%); except provide higher compression deflection strength as may be necessary to withstand installation forces and provide proper support for sealants, surface water absorption of not more than 0.1 pounds per square foot.

2.22 JOINT PRIMER/SEALER

A. Provide type of joint primer/sealer recommended by sealant manufacturer for joint surfaces to be primed or sealed.

2.23 BOND BREAKER TAPE

A. Provide polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.

2.24 SEALANT BACKER ROD

A. Provide compressible rod stack of polyethylene foam, polyurethane foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable, non-absorptive material as recommended by sealant manufacturer for back-up of and compatibility with sealant. Where used with hot-applied sealant, provide heat-resistant type which will not be deteriorated by sealant application temperature as indicated.

2.25 MISCELLANEOUS MATERIALS

A. Other materials shall be as specified or of the best grade for the proposed use as recommended by the manufacturer.

PART 3 - EXECUTION

3.01 REFERENCE

A. The manufacturer's Technical Specifications shall be considered a part of this specification and should be referred to for more specific application procedures and recommendations.

B. Application of materials shall be in strict accordance with the manufacturer's recommendations except where more stringent requirements are shown or specified. In the instance of a conflict between these specifications and those of the manufacturer, the more stringent specifications shall take precedence.

C. General Installation:
1. Protect adjacent areas with tarpaulin or other durable materials.
2. Contractor shall prevent overspray, and be responsible for parking lot areas and/or adjoining areas not part of this contract.
3. Contractor shall be responsible for sealing, as required, all openings that may allow bitumen migration or drippage, i.e. pitch dams, envelopes, and filler strips.
4. Prepare surfaces according to manufacturer's or applicator's published instructions. All metal that is to receive bitumen, or come in contact with bitumen or adhesive, shall be first primed with appropriate primer. Any prefinished galvanized sheet steel that is to receive bitumen, or come in contact with bitumen or adhesive, shall be scored, scuffed or abraded before receiving primer application.
5. Use cleaning materials or primers necessary to render an acceptable surface/substrate.
6. All surfaces/substrates shall be clean and dry prior to application of materials.
7. Prior to application of membrane, all foreign matter, gravel, etc., shall be removed from the insulation and/or substrate. Gravel or debris between the insulation/substrate and plies is not acceptable.
8. Ambient temperature shall be 50° F and rising.
9. All plies shall be laid in the direction of maximum roof slope, working from bottom of slope toward ridge.
10. Any self-adhered membranes shall be picture framed on all roof areas as the system is being applied. The outer edge of the picture frame sheet shall extend approximately two inches (2") above the top of the cant. All end laps of the field sheets of the self-adhered coal-tar elastomeric membrane shall lap the picture frame sheet a minimum of eight inches (8") or the picture frame sheet side laps shall lap the field sheet a minimum of eight inches (8").
11. Wrinkles, buckles, kinks, and fishmouths are not acceptable when laying felt and membrane.
12. Dry voids of felt on felt or membrane on membrane are not acceptable.
13. Where deteriorated base flashing is removed, primed cant strips shall be installed at the intersection of the deck and the vertical surfaces. All flashings shall be mechanically top-fastened with a termination bar a minimum of six inches (6") on center at the top leading edge, and be a minimum of eight inches (8") in height from finished membrane.
14. On slopes greater than one inch (1") in twelve inches (12"), refer to NRCA and/or manufacturer's guidelines for backnailing procedures and follow the more stringent guidelines for all specified materials.
15. All base sheet applications and surfaces that are to receive the self-adhered membranes shall be primed with a fast drying asphaltic primer. Except when self-adhered membrane is to be installed over a CTEM surface.

3.02 NAILERS

A. Wooden nailers shall be installed at gravel stops or drip edges on outside perimeter of building according to NRCA, Factory Mutual and Underwriters Laboratory guidelines.

B. All Construction: Nailers shall be the same height as the new insulation being installed where required. Nailers shall be raised if necessary by anchoring an additional nailer of appropriate height to the existing nailer if the existing nailer is not to be replaced. All existing nailers and new nailers, if required, shall be installed according to Factory Mutual and Underwriters Laboratory Guidelines.

3.03 APPLICATION OF UNDERLAYMENT

A. The fiberglass base sheet shall be primed with asphalt based primer in accordance with manufacturer's recommended procedures and allowed to thoroughly dry.

B. Unroll self-adhered membrane and allow to relax a minimum of two hours at 70° F plus temperature or longer if temperature is below 70° F. If after the period of relaxation, the membrane is not to be immediately installed, cover the membrane with white polyethylene tarp or release paper until ready for installation. All membrane applications shall be applied parallel with slope, no exceptions.

C. Slide the membrane in place aligning with three inch (3") lap line. Fold second half of relaxed roll over the first half of relaxed roll. Kiss cut the release paper at the fold, taking care not to cut the adhesive and/or membrane, install two feet (2') of self-adhered membrane pulling release paper low to roof line. Roll excess release paper on unused core and pull low to the roof surface removing the release paper while simultaneously setting the remainder of the self-adhered membrane in place. Upon completion, fold first half of membrane over installed second half and repeat procedure. The end laps of the finish ply membrane shall be a minimum of three inches (3").

D. Immediately following the laying of the self-adhering membrane, it shall be rolled in the width direction using a minimum seventy pound (70#) linoleum roller. This will prevent excessive entrapment of air beneath the membrane. The rolling is in the width direction and with the laps so as not to buck the laps.

E. Position the next roll of self-adhering membrane adjacent to the membrane already applied so that there is a three inch (3") side lap. The membrane has a one and one-half inch (1-1/2") dry lap; therefore, the three inch (3") side lap will comprise one and one-half inch (1-1/2") adhered lap and one and one-half inch (1-1/2") welded lap.

F. End laps of membrane shall be a minimum three inches (3"). If possible, lay the end laps in line.

G. Picture frame all roof areas with self-adhered coal-tar elastomeric membrane (CTEM) as finish membrane ply is being applied. Rectangular type projections should also be picture framed.

3.04 LAP SPLICE

A. Self-adhered coal-tar elastomeric membrane (CTEM) shall be installed as above with three inch (3") side laps. End laps shall be a minimum three inches (3") and in line if possible.

B. Hot-Air or Solvent Welded Side Laps:
1. WELDING OF SIDE LAPS SHALL BE DONE DAILY.
2. Clean the laps of any bituminous adhesive, dirt, or contaminants to ensure clean, dry, hot-air welded seams. All seams shall have a three inch (3") minimum width, with a one and one-half inch (1-1/2") hot-air weld, and welded the same day the membrane is laid.

3. Using either a Leister Variant hot air automatic welding machine or a Leister High Pressure 220/240, 42V double insulated hand-held blower with slot nozzle, weld the three inch (3") laps together. When using a hand-held hot-air welder, the seams should be pressed together using a hand-held roller. The speed and temperature settings of the welding equipment can be affected by the weather conditions at the site of application, therefore, these parameters should be set by the contractor by using two (2) pieces of self-adhered coal-tar elastomeric membrane (CTEM). Minimum width of hot-air weld one and one-half inches (1-1/2").
4. Lay the laps together and apply pressure to the welded seam to ensure full adhesion.
5. Allow the seams to set fully, and probe the entire length for voids. Reseam voids immediately with a hot-air gun and roller.

C. End Laps: A piece of double sided adhesive tape two inches (2") wide shall be installed so that the end of the three inch (3") lap of the top roll is centered in the middle of the tape and the double sided adhesive tape extends two inches (2") beyond the sides edges of the membrane. A piece of coal-tar elastomeric membrane (CTEM) which is four inches (4") longer and four inches (4") wider than the double sided adhesive tape shall be applied so the coal-tar elastomeric membrane (CTEM) lap strip is centered over the double sided adhesive tape. The two inch (2") dry lap around the perimeter of the coal-tar elastomeric membrane (CTEM) lap strip shall be heat-welded to the field of the self-adhered coal-tar elastomeric membrane (CTEM).

3.05 PERIMETER FASTENING

A. Wood nailers are required for perimeter gravel stops or drip edges. Field membrane and all plies shall be mechanically fastened to nailer on twelve inch (12") centers maximum.

3.06 FLASHING - GENERAL

A. Flashings shall be installed using the self-adhered coal-tar elastomeric membrane (CTEM) flashing, with length of run not to exceed the width of the material roll.

B. Wooden nailers or curbs shall be installed at all edges and openings in the roof, mechanically fastened to the deck. The nailers should be of exterior grade timber, and of the same thickness as any insulation to be used on the roof.

C. Cant strips shall be installed at the intersection of the deck and all vertical surfaces.

D. The roofing field membrane shall extend up over and to the top of cant strips at all vertical intersections or out to the roof's edge.

E. All existing substrates receiving flashing membrane shall be clean and primed with asphalt primer, prior to application.

F. Flashing membrane shall always be installed with Type IV glass felt as an underlayment. The Type IV glass felt shall be set in hot asphalt.

G. Self-adhered CTEM sheet shall always be installed with self-adhered CTEM as an underlayment.

H. All flashings shall be mechanically fastened with a termination bar a maximum of six inches (6") on center, be a minimum of eight inches (8") above finished roof height, extend a minimum of nine inches (9") onto the field of horizontal roof membrane, and not exceed the width of the material roll.

I. All surface mounted flashings terminated with a pressure bar shall have an additional surface mounted counterflashing installed immediately above the pressure bar. The counterflashing shall extend a minimum of two and one-half inches (2-1/2") below the pressure mounted termination bar. Both the top edge of the surface mounted termination bar and the surface mounted counterflashing shall be sealed with a liberal bead of sealant.

J. All vertical flashing lap seams of the self-adhered coal-tar elastomeric membrane (CTEM) shall be hot-air welded. NOTE: Clean lap area of any bituminous adhesive prior to welding.

K. The self-adhered ply sheet shall extend a minimum of two inches (2") beyond the top edge of the cant. The self-adhered flashing underlayment should then be applied from a minimum of eight inches (8") above the finished roof line down the vertical extending a minimum of nine inches (9") out onto the field of the roof. The finish ply membrane shall then be installed so as to extend from the field of the roof to a minimum of two inches (2") beyond the top edge of the cant. Following the installation of the finish ply membrane a minimum of two inches (2") above the cant, the top self-adhered flashing membrane shall be installed from a minimum of eight inches (8") above the finished roof line down the vertical extending a minimum of nine inches (9") out onto the field of the roof. All exposed vertical flashing and all exposed horizontal flashing laps shall be hot-air welded.

L. All flashing membrane shall be hot mopped to the vertical flashing and to field of roof membrane; hot-air weld vertical laps. NOTE: All bitumen shall be removed from hot-air weld area.

M. All flashing membrane shall be self-adhered to the vertical flashing, horizontal laps, and to field of roof membrane; hot-air weld vertical laps.

N. Flashing laps shall be minimum three inch (3") width, no maximum.

O. Hot-air weld of flashing lap shall be minimum one and one-half inch (1-1/2") width, no maximum.

P. Any flashing extending further than eighteen inches (18") up onto a vertical surface shall be terminated at eighteen inch (18") height intervals and be mechanically fastened at the top with a termination pressure bar. The additional height needed to be flashed will have a second piece of self-adhered coal-tar elastomeric membrane (CTEM) and Type IV fiberglass felt underlayment installed in hot asphalt lapping the terminated lower sheet by six inches (6"). The new piece shall be properly fastened with a termination bar.

Q. The self-adhered coal-tar elastomeric flashing sheets shall be run up the wall in three foot (3') widths and under the coping cap and terminated on the outside of the wall six inches (6") on center, then the coping cap reset. All side laps are to be hot-air welded. The underlayment ply shall be a self-adhered coal-tar elastomeric membrane (CTEM).

R. All hot-air welded seams/laps shall be tested daily with a probe for integrity, no variance.

S. Hot-air Welding Laps:
1. When using a hand-held hot-air welder, the seams should be pressed together using a hand-held roller. The speed and temperature settings of the welding equipment can be affected by the weather conditions at the site of application, therefore, these parameters should be set by the contractor by using two (2) pieces of self-adhered coal-tar elastomeric membrane (CTEM). Minimum width of hot-air weld one and one-half inches (1-1/2").
2. Lay the laps together and apply pressure to the welded seam to ensure full adhesion.
3. Allow the seams to set fully, and probe the entire length for voids. Reseam voids immediately with a hot-air gun and roller.

3.07 PROJECTION FLASHINGS

A. Plumbing Vents: Soil vent stack pipes shall receive new lead flashings installed in strict accordance with practices set forth in the NRCA Roofing Manual. The lead shall be carried up and over the top of the stack, and crimped down into the pipe to form a watertight seal. Projections that cannot be sealed thus should be boxed in and flashed as recommended by the roof membrane manufacturer.

B. Square Projections: Lay the self-adhered coal-tar elastomeric membrane (CTEM) up to the projection, and cut membrane so that it will extend twelve inches (12") beyond the projection. Cut a slit in the membrane to correspond with the position of the projection, and lay the membrane in hot asphalt. Apply another layer of membrane in exactly the same fashion, but from the opposite direction. For metal flange-type projections, after doing above, strip in with six inch (6") strips of membrane.

C. Round Projections: Cut membrane square and eighteen inches (18") from perimeter of projection. Slit square membrane with an "X" of proper size to ensure a close fit and positive seal. Place over projection, and adhere to clean membrane already on the roof. Cut a six inch (6") piece of membrane to apply as a collar, and secure with all stainless steel clamp.

3.08 STANDING SEAM METAL ROOF

A. General:
1. Examine substrate to ensure it is properly secured and prepared to receive metal roofing.
2. Ensure substrate is installed flat, free from objectionable warp, wave and buckle.
3. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Standing Seam Roof Installation:
1. Comply with manufacturer's instructions for assembly, installation and erection in order to achieve weathertight installation. Install in accordance with approved shop drawings.
2. Standing Seam System:
   a) Install panels in accordance with manufacturer's instructions and recommendations.
   b) Prior to application of metal roof panels, all underlayment shall be covered with kraft sheathing separator sheet or similar, no exceptions.
   c) Anchor securely in place using clips and fasteners spaced in accordance with manufacturer's recommendations for design and wind load criteria, minimum wind uplift of FM 1-90 is required or as per the most current published Factory Mutual windspeed map for the area for which the project is located.
   d) Fully seat adjacent panel to achieve continuous engagement of standing seam joint.
   e) All panels shall be installed in a workmanlike manner and panels true, straight and watertight.

3. Dissimilar Metals:
   a) Where sheet metal is in contact with dissimilar metals, execute juncture to facilitate drainage and minimize possibility of galvanic action.
   b) At point of contact with dissimilar metal, coat metal with protective paint or tape which can be placed between metals.
4. Field apply sealant to penetrations, transitions and other locations necessary (not standing seam) for airtight, waterproof installation.

C. Cleaning: Clean exposed surfaces of work promptly after completion of installation.

D. Protection: Protect work as required to ensure roofing will be without damage at time of final completion.

END OF SECTION

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION REQUIREMENTS

A. Submittals: Product Data and color Samples.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under service and application conditions.

B. Elastomeric Sealants: Comply with ASTM C 920.
   1. Single-component, neutral-curing silicone sealant, Type S; Grade NS; Class 25; Uses T, M, and O, with the additional capability to withstand [50 percent movement in both extension and compression for a total of 100 percent movement] [100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement]. Use for building expansion joints.
   2. Single-component, nonsag polysulfide sealant, Type S; Grade NS; Class 12-1/2; Uses NT, M, G, A, and O. For general exterior use.
   3. Single-component, neutral-curing silicone sealant, Type S; Grade NS; Class 25; Uses T, NT, M, G, A, and O. For general exterior use.
   4. Single-component, nonsag urethane sealant, Type S; Grade NS; Class 25; and Uses NT, M, A, and O. For general exterior use.
   5. Single-component, nonsag urethane sealant, Type S; Grade NS; Class 25; Uses T, NT, M, G, A, and O. Use for exterior traffic-bearing joints, where slope precludes use of pourable sealant.
   6. Single-component, pourable urethane sealant, Type S; Grade P; Class 25; Uses T, M, G, A, and O. Use for exterior traffic-bearing joints.

7. Single-component, mildew-resistant silicone sealant, Type S; Grade NS; Class 25; Uses NT, G, A, and O; formulated with fungicide. Use for interior sealant joints in ceramic tile, stone, and other hard surfaces in kitchens and toilet rooms and around plumbing fixtures.

C. Latex Sealant: Single-component, nonsag, mildew-resistant, paintable, acrylic-emulsion sealant complying with ASTM C 834. For interior use only at perimeters of door and window frames.

D. Acoustical Sealant for Exposed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834. For interior use only at acoustical assemblies.

E. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound. For interior use only at acoustical assemblies.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with ASTM C 1193.

B. Comply with ASTM C 919 for use of joint sealants in acoustical applications.

END OF SECTION

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

A. Section Includes:

1. Standard hollow metal doors and frames.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section “Wood Doors” for wood doors in hollow metal frames.
3. Division 08 Section "Door Hardware (Scheduled by Describing Products)" for door hardware for hollow metal doors and frames.
4. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

1.4 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.

C. Samples for Verification:

1. Samples are only required by request of the architect and for manufactures that are not current members of Steel Door Institute.
2. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 125 mm).
3. For the following items, prepared on Samples about 12 by 12 inches (305 by 305 mm) to demonstrate compliance with requirements for quality of materials and construction:

a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Preinstallation Conference: Conduct conference at Project site for hollow metal frames requiring electrical knockout boxes to verify installation of conduit on frames.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with this section requirements, provide products by one of the following:

1. Amweld Building Products, LLC.
2. Ceco Door Products; an Assa Abloy Group company.
3. Curries Company; an Assa Abloy Group company.
4. Steelcraft; an Ingersoll-Rand company.
5. No Substitution; only material from an SDI member will be allowed on the jobsite unless prior approval is given in accordance with substitution request requirements per General Requirements section.

2.2 MATERIALS

A. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality, special killed.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Glazing: Comply with requirements in Division 08 Section "Glazing."

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide 1 3/4" thick beveled and handed doors of design indicated, fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: Flush panel

2. Core Construction: Manufacturer's standard polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.

3. Vertical Edges for Single-Acting Doors: Beveled edge

   a. Beveled Edge: 1/8 inch in 2 inches (3 mm in 50 mm).

4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch (54-mm) radius.
5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheets. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 2 and Physical Performance Level A (Heavy Duty), 16 gage (0.053-inch - 1.3-mm-) thick steel faces, with threat side of door exceeding 14 gage (0.067-inch - 1.7-mm-) thick steel, Model 2 (Seamless face and edges).
2. Provide doors with 22 gage Z-Channels steel stiffeners placed at 6 inches apart with foamed in place polyurethane core.
3. Provide thermal insulation with calculated R factor of 11.01 per ASTM C518 Standards.

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), minimum 16 gauge (0.053-inch - 1.3-mm-) thick steel, Model 2 (Seamless face and edges).

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheets.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as face welded joints and back weld joints continuously, unless otherwise indicated.
3. Frames for Level 3 Steel Doors: minimum 14 gauge 0.067-inch- (1.7-mm-) thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as face welded unless otherwise indicated.
3. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
4. Frames for Level 3 Steel Doors: minimum 16 gauge 0.053-inch- (1.3-mm-) thick steel sheet.
5. Frames 48-inches and wider in opening width are required to be minimum 14 gauge 0.067-inch- (1.7-mm-) thick steel sheet.

6. Frames for Wood Doors: minimum 16 gauge 0.053-inch- (1.3-mm-) thick steel sheet.
7. Frames for Borrowed Lights: minimum 16 gauge 0.053-inch- (1.3-mm-) thick steel sheet.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Stud-Wall Type: Designed to engauge stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as frames in which they are installed.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches (0.4 mm) thick.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8

C. Hollow Metal Doors:

1. Exterior Doors:

    a. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Top of door to be flush and completely sealed joints in top edges of doors against water penetration.
    b. Provide Polyurethane core.

2. Glazed Lites: Factory cut openings in doors with applied flush trim to fit.
3. Astragals: Provide overlapping astragal as noted in door hardware sets in Division 8 Door Hardware on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 8 Door Hardware.
5. Seamless Edge: Provide seamless edge on hollow metal doors by intermittently tack welding seam, grinding smooth and finishing edge free from defects and blemishes.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Continuously backweld joints at exterior frames.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Equal Rabbet Frames: Provide frames with equal rabbet dimensions unless glazing and removable stops required wider dimension on glass side of frame.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 42-inch and wider with mortise/butt type hinges only at top hinge location to deter against hinge reinforcement sag.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 8 Door Hardware.
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops; provide security head screws at exterior locations.
7. Grout Guards: Weld guard boxes to frame at back of mortise hardware prep in frames at all hinge, strike and other recessed hardware preps regardless of grouting requirements.

8. Provide A60 Galvannealed coating at frames in restrooms with showers/Jacuzzi, clean areas such as surgery rooms and surgical suites, clean rooms, and soil rooms.

9. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
10. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

        1) Two anchors per jamb up to 60 inches (1524 mm) high.
        2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
        3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.

    b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

1) Three anchors per jamb up to 60 inches (1524 mm) high.
2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
5) Two anchors per head for frames above 42 inches (1066 mm) wide and mounted in metal-stud partitions.

11. Door Silencers: Except on weather-stripped or gasketed doors, drill stops to receive door silencers as follows. Keep holes clear during construction. Silencers to be supplied by frame manufacture regardless if specified in division 8 Door Hardware.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricators shop

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that glazed lites are capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.
5. Gap for butted or mitered joints in glass stop should not exceed .0625-inch.

2.9 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

a. At fire-protection-rated openings, install frames according to NFPA 80.
b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
c. Install frames with removable glazing stops located on secure side of opening.
d. Install door silencers in frames before grouting.

e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post installed expansion anchors.

a. Floor anchors may be set with powder-actuated fasteners instead of post installed expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
6. Field Supplied Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
7. Grouting Requirements:

a. Do not grout head of frames unless reinforcing has been installed in head of frame.
b. Do not grout vertical or horizontal closed mullion members.

8. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.

    a. Secure exterior removable stops with security head screws.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 33 23 - OVERHEAD COILING SERVICE DOORS

PART 1 GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 SECTION INCLUDES

A. Overhead coiling insulated doors.

B. Overhead coiling doors.

1.2 RELATED SECTIONS

A. Section 05 50 00 - Metal Fabrications: Support framing and framed opening.

B. Section 06 10 00 - Finish Carpentry: Wood jamb and head trim.

C. Section 08 71 00 - Door Hardware: Product Requirements for cylinder core and keys.

D. Section 09 91 00 - Painting: Field applied finish.

E. Section 26 05 33 - Raceway and Boxes: Conduit from electric circuit to door operator and from door operator to control station.

F. Section 26 05 83 - Wiring Connections: Power to disconnect.

1.3 REFERENCES

A. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

C. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

D. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

F. NEMA MG 1 - Motors and Generators.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Overhead coiling insulated doors:
1. Wind Loads: Design door assembly to withstand wind/suction load of 20 psf (958 Pa) without damage to door or assembly components.
2. Operation: Design door assembly, including operator, to operate for not less than 20,000 cycles.

B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Details of construction and fabrication.
4. Installation instructions.

C. Shop Drawings: Include detailed plans, elevations, details of framing members, anchoring methods, required clearances, hardware, and accessories. Include relationship with adjacent construction.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and patterns.

F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

G. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience in the fabrication and installation of security closures.

B. Installer Qualifications: Installer Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

C. Store materials in a dry, warm, ventilated weathertight location.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 COORDINATION

A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100.
Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: info@overheaddoor.com.

B. Substitutions: permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 25 00.

2.2 INSULATED OVERHEAD COILING SERVICE DOORS

A. Overhead Coiling Stormtite Insulated Service Doors: Overhead Door Corporation 625 Series.
1. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.
a. Flat profile type F-265i for doors up to 40 feet (12.19 m) wide.
b. Front slat fabricated of:
1) 22 gauge galvanized steel.
c. Back slat fabricated of:
1) 24 gauge galvanized steel.
d. Slat cavity filled with CFC-free foamed-in-place, polyurethane insulation.
1) R-Value: 7.7, U-Value: 0.13.
2) Sound Rating: STC-21.

2. Finish:
a. Galvanized Steel: Slats and hood galvanized in accordance with ASTM A 653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat.
1) Powder coat: PowderGuard
(a) PowderGuard Weathered Finish: Industrial textured powder coat provides a thicker, more scratch resistant coat. Applied to entire door system including slats, guides, bottom bar and head plate.

3. Weatherseals:
a. Vinyl bottom seal, exterior guide and internal hood seals.

4. Bottom Bar:
   a. Two galvanized steel angles minimum thickness 1/8 inch (3 mm) bolted back to back to reinforce curtain in the guides.

5. Guides: Three Structural steel angles
   a. Finish: PowderGuard Weathered finish with iron/black powder.

6. Brackets:
   a. Galvanized steel to support counterbalance, curtain and hood.

7. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.

8. Hood: Provide with internal hood baffle weatherseal.
   a. 24 gauge galvanized steel with intermediate supports as required.

9. Manual Operation:
   a. Chain hoist.

10. Windload Design:
    a. Standard windload shall be 20 PSF.

11. Locking:
    a. Chain keeper locks for chain hoist operation.

12. Wall Mounting Condition:
    a. Reference drawings.

13. Operation: Chain operated doors shall open and close with a maximum of 30 pounds of effort utilizing an endless chain and cast iron reduction gears.

2.3 OVERHEAD COILING SERVICE DOORS

A. Industrial Doors: Overhead Door Corporation, 610 Series Service Doors.
   1. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.

      a. Curved profile type C-187 for doors up to 15 feet 4 inches (4.67 m) wide, fabricated of:
         1) 22 gauge galvanized steel.

      b. Curved profile type C-275 for doors up to and between 15 feet 4 inches (4.67 m) and 18 feet 4 inches (5.59 m) wide, fabricated of:
         1) 22 gauge galvanized steel.

   2. Finish:
      a. Galvanized Steel: Slats and hood galvanized in accordance with ASTM A 653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat.
         1) Powder coat: PowderGuard
            (a) PowderGuard Weathered Finish: Industrial textured powder coat provides a thicker, more scratch resistant coat. Applied to entire door system including slats, guides, bottom bar and head plate.

   3. Weatherseals:

a. Vinyl bottom seal.

4. Bottom Bar:
   a. Two galvanized steel angles.

5. Guides: Roll-formed galvanized steel shapes attached to continuous galvanized steel wall angle.
   a. Finish: PowderGuard Weathered finish with iron/black powder.

6. Brackets:
   a. Galvanized steel to support counterbalance, curtain and hood.

7. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.

8. Hood:
   a. 24 gauge galvanized steel with intermediate supports as required.

9. Manual Operation:
   a. Chain hoist for doors up to 96 SF.

10. Windload Design:
    a. Standard windload shall be 20 PSF.

11. Locking:
    a. Two interior bottom bar slide bolts for manually operated doors.

12. Wall Mounting Condition:
    a. Reference drawings.

13. Operation: Chain operated doors shall open and close with a maximum of 30 pounds of effort utilizing an endless chain and cast iron reduction gears.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify opening sizes, tolerances and conditions are acceptable.

B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07 92 00.

F. Install perimeter trim and closures.

G. Instruct Owner’s personnel in proper operating procedures and maintenance schedule.

3.4 ADJUSTING

A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.

B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 CLEANING

A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.

B. Remove labels and visible markings.

C. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 PROTECTION

A. Protect installed products until completion of project.

END OF SECTION

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work under this section comprises of furnishing hardware specified herein and noted on drawings for a complete and operational system, including any electrified hardware components, systems, controls and hardware for aluminum entrance doors. Any door shown on the drawing and not specifically referenced in the hardware sets shall be provided with identical hardware as specified on other similar openings and shall be included in the General Contractor's base bid. All fire rated door shall be provided with fire rated hardware as required by local code Authority as part of the General Contractor's base bid. The hardware supplier shall verify all cylinder types specified for locking devices supplied as part of the door system with the door manufacturer and/or door supplies.

B. The General Contractor shall notify the Architect in writing of any discrepancies (five (5) days prior to bid date) that could and/or would result in hardware being supplied that is none functional, hardware specified and/or hardware that has not been specified that will result in any code violations and any door that is not covered in this specification. **Failure of the General Contractor to address any such issue could be considered acceptance of the hardware specified and any and/or all discrepancies could be corrected at the General Contractor's expense**.

C. Items include but are not limited to the following:

1. Hinges - Pivots
2. Flush Bolts
3. Exit Devices
4. Locksets and Cylinders
5. Push Plates - Pulls
6. Coordinators
7. Closers
8. Kick, Mop and Protection Plates
9. Stops, Wall Bumpers, Overhead Controls
10. Electrified Hold Open Devices
11. Thresholds, Seals and Door Bottoms
12. Silencers
13. Miscellaneous Trim and Accessories

1.02 RELATED DOCUMENTS, drawings and general provisions of contract, including General and Supplementary Conditions, and Division 1 Specification sections, apply to this section.

1.03 RELATED WORK specified elsewhere that should be examined for its effect upon this section:

A. Section 06 20 00 - Finish Carpentry
B. Section 08 11 13 – Steel Doors and Frames
C. Section 08 14 16 – Flush Wood Doors
D. Sections 08 31 13 – Access Doors
E. Section 08 39 00 – Watertight Doors
E. Section 08 41 13 – Aluminum Entrances, Storefront and Window Framing
F. Sections 08 80 00 – Glass and Glazing
G. Sections 09 91 00 - Painting
H. Division 26 – Electrical
I. Division 28 – Access Control

1.04 REFERENCES SPECIFIED in this section subject to compliance as directed:

A. NFPA-80 - Standard for Fire Doors and Windows
B. NFPA-101 - Life Safety Code
C. ADA - The Americans with Disabilities Act - Title III - Public Accommodations
D. ANSI-A 117.1 - American National Standards Institute - Accessible and Usable Buildings and Facilities
E. ANSI-A 156.5 - American National Standards institute -Auxiliary Locks and Associated Products
F. UFAS - Uniform Federal Accessibility Standards
G. UL - Underwriter's Laboratories
H. WHI - Warnock Hersey International, Testing Services
I. State and Local Codes including Authority Having Jurisdiction
J. UL10C – Positive Pressure
K. IBC-2015 – International Building Code
L. NFPA-70 – International Electrical Code

1.05 SUBMITTALS

A. HARDWARE SCHEDULES submit copies of schedule in accordance with Division 1, General Requirements. Schedule to be in vertical format, listing each door opening, including: handing of opening, all hardware scheduled for opening or otherwise required to allow for proper function of door opening as intended, and finish of hardware. At doors with door closers or door controls include degree of door opening. Supply the schedules all Finish Hardware within two (2) weeks from date purchase order is received by the hardware supplier.

B. Submit manufacturer's cut/catalog sheets on all hardware items and any required special mounting instructions with the hardware schedule.

C. Certification of Compliance:

1. Submit any information necessary to indicate compliance to these specifications as required.
2. Submit a statement from the manufacturer that electronic hardware and systems being supplied comply with the operational descriptions exactly as specified.

D. Submit any samples necessary as required by the Architect.

E. Templates for finish hardware items to be sent to related door and frame suppliers within three (3) working days of receipt of approved hardware schedule.

F. Doors and Frames used in positive pressure opening assemblies shall meet UL10C in areas where this specification includes Seals for smoke door.

1.06 QUALITY ASSURANCE

A. Hardware supplier to be a qualified, Factory Authorized, direct distributor of the products to be furnished. In addition, the supplier to have in their regular employment an AHC or AHC /CDC and/or a person of equivalent experience (minimum fifteen (15) years in the industry) who will be made available at reasonable times to consult with the Architect/Contractor and/or the City of Edinburg Representative regarding any matters affecting the finish hardware on this project.

B. All hardware used in labeled fire or smoke rated openings to be listed for those types of openings and bear the identifying label or mark indicating UL. (Underwriter's Laboratories) approved for fire. Exit devices in non-labeled openings to be listed for panic.

1.07 DELIVERY, HANDLING AND PACKAGING

A. Furnish all hardware with each unit clearly marked and numbered in accordance with the hardware schedule. Include door and item number for each.

B. Pack each item of hardware completes with all necessary parts and fasteners.

C. Properly wrap and cushion each item to prevent scratches and dents during delivery and storage.

1.08 SEQUENCING AND SCHEDULING

Any part of the finish hardware required by the frame or door manufacturers or other suppliers that is needed to produce doors or frames is to be sent to those suppliers in a timely manner, so as not to interrupt job progress.

1.09 WARRANTY

All finish hardware shall be supplied with a one- (1) year warranty against defects in materials and workmanship, commencing with substantial completion of the project except as follows:

1. All Closers shall have a thirty- (30) year written warranty.
2. All Grade 1 “T” Locksets shall have a ten- (10) year written warranty.
3. All Continuous Hinges shall have a ten-(10) year written warranty.

PART 2 – PRODUCTS

2.01 FASTENERS

A. Furnish with finish hardware all necessary screws, bolts and other fasteners of suitable size and type to anchor the hardware in position for a long life under hard use.

B. Furnish fastenings where necessary with expansion shields, toggle bolts and other anchors designated by the Architect according to the material to which the hardware is to be applied and the recommendations of the hardware manufacturer. All closers and exit devices on labeled wood doors shall be through-bolted if required by the door manufacturer. All thresholds shall be fastened with wood screws and plastic anchors. Where specified in the hardware sets, security type fasteners of the type called for are to be supplied.

C. Design of all fastenings shall harmonize with the hardware as to material and finish.

D. All hardware shall be installed with the Manufacturers standard screws as provided. The use of any other type of fasteners shall not be permitted. The general contractor shall provide wood blocking in all stud walls specified and/or scheduled to receive wall stops, No Exception.

2.02 ENVIRONMENTAL CONCERN FOR PACKAGING

The hardware shall ship to the job site is to be packaged in biodegradable packs such as paper or cardboard boxes and wrapping.

2.03 HINGES

A. All hinges to be of one manufacturer as hereafter listed for continuity and consideration of warranty. Provide one of the following manufacturers Ives, Hager, Mc Kinney or Stanley.

B. Unless otherwise specified provide five-knuckle, heavy-duty, button tip, full mortise template type hinges with non-rising loose pins. Provide non-removable pins for out swinging doors at secured areas or as called for in this specification (Refer to 3.02 Hardware Sets).

C. Provide all out-swinging doors with non-removable pins or security studs as called for in 3.02 Hardware Sets. Furnish three (3) hinges up to 90 inches high and one (1) additional hinge for every 30 inches or fraction thereof.

D. Furnish three (3) hinges up to 90 inches high and one (1) additional hinge for every 30 inches or fraction thereof.

E. Provide size 4½" x 4½" for all 1¾" thick doors up to and including 36 inches wide. Doors over 1¾" through 2¼" thick, use 5" x 5" hinges. Doors over 36 inches use 5" x 4½" unless otherwise noted in 3.02 Hardware Sets.

F. Were required to clear the trim and/or to permit the doors to swing 180 degrees furnish hinges of sufficient throw.

G. Provide heavy weight hinges on all doors over 36 inches in width.

H. At labeled door's steel or stainless steel, bearing-type hinges shall be provided. For all doors equipped with closers provide bearing-type hinges.

2.04 LOCK AND LOCK TRIM

A. All locksets, latch sets, and trim to be of one manufacturer as hereafter listed for continuity of design and consideration of warranty. Locksets specified are Falcon "T" series with the Dana levers and shall be provided as specified or acceptable products manufactured by Schlage (ND Series) or Sargent (11 Line).

B. Provide metal wrought box strike boxes and curved lip strikes with proper lip length to protect trim of the frame, but not to project more than 1/8 inch beyond frame trim or the inactive leaf of a pair of doors.

C. Mechanical Locks shall meet ANSI Operational Grade 1, Series 4000 as specified.

1. Hand of lock is to be field reversible or non-handed.
2. All lever trim is to be through-bolted through the door.

2.05 CYLINDERS AND KEYING

A. Provide all exterior and interior locks or Exit Devices requiring cylinders keyed to the New Small Format Interchangeable Core Mater Key System as instructed by the City of Edinburg Representative. Cylinders shall comply with performance requirements of ANSI A156.5. All keys shall be of nickel silver material only. The hardware supplier shall meet with the General Contractor, the Architect and the City of Edinburg Representative at the project jobsite to determine all permanent keying requirements.

B. Cylinders shall be factory keyed and factory maintained as directed by the City of Edinburg Representative and the Architect. Provide two- (2) keys per cylinder and four- (4) master keys per master used.

C. Factory stamp all keys "Do not duplicate" and with key symbol as directed by the City of Edinburg Representative. Visual key control shall be provided on all permanent keys and cylinders.

D. Provide temporary keyed construction cores for the duration of the construction phase. Provide ten (10) construction keys and two (2) construction control keys. All construction cores shall be returned to the hardware supplier upon installation of permanent cores.

2.06 SURFACE MOUNTED DOOR CLOSERS

A. All closers for this project shall be the products of a single manufacturer for continuity of design and consideration of warranty. All door closers shall be mounted as to achieve the maximum degree of opening (trim permitting).

B. All closers to be heavy duty, surface-mounted, fully hydraulic, rack and pinion action with high strength case iron cylinder to provide control throughout the entire door opening and closing cycle.

C. Size all closers in accordance with the manufacturer's recommendations at the factory.

D. All closers to have adjustable spring power sizes 1 or 2 through 4 or 6 and non-critical regulating screw valves for closing speed, latching speed and back-check control as a standard feature unless specified otherwise.

E. Provide closer covers only if provided as a standard part of the door closer package.

F. The hardware supplier shall provide all required brackets, spacers or filler plates as required by the manufacture for a proper and functional installation as part of their base bid.

G. Supply appropriate arm assembly for each closer so that closer body and arm are mounted on non-public side of door opening and on the interior side of exterior openings, except where required otherwise in the hardware sets.

H. Provide drop plates and any additional mounting brackets required for the proper installation of the door closer shall be included in the hardware supplier's base bid.

I. Finish: Baked on Powder Coated finish shall match other hardware.

J. Provide and mount all door closers with sex bolts as provided by the manufacturer.

K. Closers shall be LCN "1461" series as specified or acceptable products manufactured by Sargent "281" series and Norton (7501BF) series.

2.07 DOOR STOPS AND HOLDERS

A. Door stops are to be furnished for every door leaf. Every door is to have a floor, wall, or an overhead stop.

B. Place doorstops in such a position that they permit maximum door swing, but do not present a hazard of obstruction. Furnish floor strikes for floor holders of proper height to engage holders of doors.

C. Where overhead stops and holders are specified, or otherwise required for proper door operation, they are to be heavy duty and of extruded brass, bronze or stainless steel with no plastic parts as specified. The General Contractor shall provide wood blocking in all stud walls specified and scheduled to receive wall stops.

D. Finish: Shall match other hardware where available.

E. Acceptable Products

1. Floor and wall stops as listed in hardware sets. Equivalent products as manufactured by Ives, ABH and Trimco are acceptable.

2.08 PUSH PLATES, DOOR PULLS, AND KICKPLATES

A. All push plates, door pull, kick plates and other miscellaneous hardware as listed in hardware sets. Equivalent products as manufactured by Ives, Hager and Trimco are acceptable.

B. Kick plates to be 10 inches high and Mop plates to be 6 inches high, both by 1-½ inches or 1 inch less than door width (LDW) as specified. They are to be of 16-gauge thick base metal. For door with louvers or narrow bottom rails, kick plate height to be 1 inch less dimension shown from the bottom of the door to the bottom of the louver or glass.

C. Where required armor plates, edge guards and other protective hardware shall be supplied in sizes as scheduled in the hardware sets.

D. Finish: Same as other hardware where available.

2.09 FLUSH BOLTS AND COORDINATORS

A. Provide Flush bolts with Dust Proof Strikes as indicated in the individual hardware sets by Ives, Hager and Trimco are acceptable. Finish shall match the adjacent hardware.

2.10 THRESHOLDS AND SEALS

A. Provide materials and finishes as listed in hardware sets. Zero products have been specified to set a high level of quality, equivalent product by manufactured by National Guard Products and Pemko shall be acceptable. All thresholds must be in accordance with the requirements of the ADA and ANSI A117.1.

B. Provide thresholds with wood screws and plastic anchors. Supply all necessary anchoring devices for weather strip and sound seal.

C. Seals shall comply with requirements of UL10C. All thresholds, door bottoms and weather strip inserts shall be a silicone based product as specified in 3.02 Hardware Sets. Other materials used shall be rejected, unless originally specified.

D. Seals shall comply with the requirements of the Wood Door Manufacturer’s certification requirements.

2.11 FINISHES

A. Finishes for all hardware are as required in this specification and the hardware sets.

B. Special care is to be taken to make uniform the finish of all various manufactured items.

2.12 DOOR SILENCERS

A. Provide door silencers at all openings without gasket. Provide two- (2) each at pair of doors and three- (3) or four- (4) each for each single door (coordinate with the frame manufacturer).

2.13 PROPRIETARY PRODUCTS

A. References to specific products are used to establish quality standards of utility and performance. Unless otherwise approved provide only the specified product.

B. All other materials, not specifically described, but required for a complete and proper finish hardware installation, are to be selected by the Contractor, subject to the approval of the Architect and the City of Edinburg Representative.

C. Architect and the City of Edinburg Representative reserve the right to approve all the substitutions proposed for this specification. All requests for substitution to be made prior to bid in accordance with Division 1, General Requirements, and are to be in writing, hand delivered to the Architect. Two (2) copies of the manufacturer's brochures and a physical sample of each item in the appropriate design and finish shall accompany requests for substitution.

PART 3 - EXECUTION

3.01 INSTALLATION AND SERVICE ITEMS OF FINISH HARDWARE

A. All finish hardware shall be installed by an experienced finish hardware installer with at least ten (10) years of experience after a pre-installation meeting between the contractor, hardware Manufacturers representative, the hardware supplier, the hollow metal supplier and the wood door supplier. The finish hardware installer shall be responsible for the proper installation and function of all doors and hardware.

B. The hardware supplier's office and/or warehouse shall be located within a one seventy-five (75) mile radius of the project site as to better service the general contractor and the City of Edinburg Representative during this project.

C. Check hardware against the reviewed hardware schedule upon delivery. Store the hardware in a dry and secure location to protect against loss and damage.

D. Install finish hardware in accordance with approved hardware schedule and manufacturers' printed instructions. Pre-fit hardware before finish is applied to door; remove and reinstall after finish is complete and dry. Install and adjust hardware so that parts operate smoothly, close tightly, and do not rattle.

E. Mortise and cutting to be done neatly, and evidence of cutting to be concealed in the finished work. Protect all Finish hardware from scratching or other damage.

3.02 HARDWARE SETS
SPEXTRA: 476846
HARDWARE GROUP NO. 01 - EXTERIOR - MEN & WOMEN
FOR USE ON MARK/DOOR #(S):
101 104

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	CLASSRM DEADBOLT	D111B	626	FAL
1	EA	SFIC CONST. CORE	C607CCA	622	FAL
1	EA	SFIC CORE	C607	626	FAL
1	EA	PUSH PLATE	8200 8" X 16"	630	IVE
1	EA	PULL PLATE	8305 8" 3.5" X 15"	630	IVE
1	EA	SURFACE CLOSER	4040XP TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	GASKETING	8303AA-HEAD & JAMBS	AA	ZER
1	EA	DOOR SWEEP	50MAA-DOOR WIDTH	AA	ZER
1	EA	THRESHOLD	545A-MSLA-10-FRAME WIDTH	A	ZER
1	EA	RAIN DRIP	142A-HEAD PLUS 4"	A	ZER

HARDWARE GROUP NO. 02 - EXTERIOR - FAMILY RESTROOM

FOR USE ON MARK/DOOR #(S):
103

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	ENTRY LOCK	T501B DAN	626	FAL
1	EA	TURN I/S X OCC IND	D271	626	FAL
1	EA	SFIC CONST. CORE	C607CCA	622	FAL
1	EA	SFIC CORE	C607	626	FAL
1	EA	SURFACE CLOSER	4040XP TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	GASKETING	8303AA-HEAD & JAMBS	AA	ZER
1	EA	DOOR SWEEP	50MAA-DOOR WIDTH	AA	ZER
1	EA	THRESHOLD	545A-MSLA-10-FRAME WIDTH	A	ZER
1	EA	RAIN DRIP	142A-HEAD PLUS 4”	A	ZER
1	EA	COAT AND HAT HOOK	582B26D	626	IVE

HARDWARE GROUP NO. 03 - EXTERIOR - STORAGE

FOR USE ON MARK/DOOR #(S):
102

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD-83”	628	IVE
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	STOREROOM LOCK	T581B DANE	626	FAL
1	EA	SFIC CONST. CORE	C607CCA	622	FAL
1	EA	SFIC CORE	C607	626	FAL
2	EA	OH STOP	104S	630	GLY
2	EA	ARMOR PLATE	8400 36" X 1 1/2" LDW B-CS	630	IVE
1	EA	GASKETING	8303AA-HEAD & JAMBS	AA	ZER
1	EA	ASTRAGAL	43SP-DOOR HEIGHT	SP	ZER
2	EA	DOOR SWEEP	50MAA-DOOR WIDTH	AA	ZER
1	EA	THRESHOLD	65A-MSLA-10-FRAME WIDTH	A	ZER
1	EA	RAIN DRIP	142A-HEAD PLUS 4”	A	ZER

HARDWARE GROUP NO. 04 - EXTERIOR – CONCESSION STAND & INTERIOR STORAGE

FOR USE ON MARK/DOOR #(S):
100 100A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD-83”	628	IVE
1	EA	STOREROOM LOCK	T581B DANE	626	FAL

1	EA	SFIC CONST. CORE	C607CCA	622	FAL
1	EA	SFIC CORE	C607	626	FAL
1	EA	LOCK GUARD	LG1	630	IVE
1	EA	OH STOP	104S	630	GLY
1	EA	ARMOR PLATE	8400 36" X 1 1/2" LDW B-CS	630	IVE
1	EA	GASKETING	8303AA-HEAD & JAMBS	AA	ZER
1	EA	DOOR SWEEP	50MAA-DOOR WIDTH	AA	ZER
1	EA	THRESHOLD	65A-MSLA-10-FRAME WIDTH	A	ZER
1	EA	RAIN DRIP	142A-HEAD PLUS 4”	A	ZER

HARDWARE GROUP NO. 05 - EXTERIOR – CONCESSION STAND ROLLING DOORS

FOR USE ON MARK/DOOR #(S):
100B 100C

EACH TO HAVE:

1	EA	Mortise Cylinder	10 63 41	26D	Sargent

NOTE: Balance of hardware by door mfgr. Verify cylinder type and cam required.

END OF SECTION

SECTION 09 91 00 – PAINTING AND FINISHING

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide all labor, materials, and equipment required for all painting, staining and finishing as indicated in the drawings, the approved submittals, and as specified herein. Painted or stained systems include but are not necessarily limited to the items listed below:

B. EXTERIOR SYSTEMS:

1. All visible wood unless noted otherwise.
2. All ferrous metal. All galvanized metal unless noted otherwise. Touch-up on welds or damaged finishes.
3. Exposed conduit, piping, etc., except for roof mounted piping not visible.
4. Exposed roof mounted equipment visible from ground level or from upper floors of the building.
5. All exposed concrete masonry units.
6. All items normally painted in accordance with good construction practice.

C. INTERIOR SYSTEMS:

1. All visible wood or behind cabinet doors unless noted otherwise.
2. All ferrous metal. All galvanized metal unless noted otherwise. Touch-up on welds or damaged finishes. Structural steel, steel joists and deck exposed to view except in mechanical rooms.
3. Exposed conduit, piping, outlet boxes, raceways, and panel boxes except galvanized or aluminum piping located in mechanical or electrical rooms.
4. All exposed concrete masonry units, gypsum board and plaster unless otherwise noted.
5. All factory-primed hardware. Back-priming of all wood trim, millwork or finished carpentry prior to installation.
6. All hollow metal doors and frames.
7. All items normally painted in accordance with good construction practice.
8. All unfinished louvers and grilles.

1.3 WORK TYPICALLY EXCLUDED

A. Shop applied primer on structural steel and miscellaneous metals items.

B. Aluminum frames, doors, and windows.

C. Plastic clad casework, millwork, and wall panels.

D. Factory finished equipment unless noted otherwise (provide job touch-up).

1.4 DRAWING REFERENCE: Reference any paint or finish notes in the drawings for any pre-selected colors or other requirements.

1.5 SUBMITTALS

A. Submit manufacturer's product data describing each proposed type of paint, sealer, stain, or coating and it's recommended use. Include viscosity and percent solids information. Where not the specified base manufacturer, list the specified brand name and type and the proposed substitute. The Architect shall be the sole judge as to equivalency of systems.

B. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.

1.6 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of two years after the date of Substantial Completion of the project.

B. Warranted defects shall include but not necessarily be limited to peeling, crazing, cracking, blistering, mildewing, chalking or dusting, pin holes, color fade or loss of hardness or sheen.

1.7 QUALITY ASSURANCE

A. Painting contractor shall have a minimum of 5 years experience in the application of the specified systems for projects of similar size and scope as this project.

B. If requested by the Architect, provide system manufacturer's certification of the proposed painting contractor as approved for application of the product.

1.8 DELIVERY, STORAGE AND HANDLING

A. Do not deliver painting materials to the jobsite until spaces and surfaces are ready for painting.

B. Deliver materials in manufacturer's original containers, unopened except for shop mixing of colors. Containers shall bear manufacturer's readable labels indicating brand and type of paint. Any additional containers with labels indicating products not approved shall be removed form the jobsite. Any applied material not previously approved by the Architect is subject to removal and reapplication with the appropriate approved product.

C. Store materials in environmentally controlled area. Interior products shall be acclimated to a temperature range of 50-80 degrees F. at least 24 hours prior to application.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. TYPICAL PAINTS: Systems are based on the first listed manufacturer. Only equivalent systems provided by specified manufacturers in accordance with attached Product Comparison sheet and as approved by the Architect are approved for use.

1. Sherwin Williams, Inc.
2. Pittsburgh Paints
3. Pratt & Lambert
4. Benjamin Moore Co.

B. SPECIALTY PAINTS:

1. Epoxies: Sherwin Williams, PPG, Pratt & Lambert.

C. SUBSTITUTIONS: In accordance with Section 01 25 00 Substitution Procedures.

2.2 INTERIOR SYSTEMS

A. SYSTEM TYPES FOR NEW WALLS (Unless indicated otherwise on Finish Schedule or drawings):

1. Drywall in toilet rooms, storage rooms, and mechanical/electrical/toilet rooms/ classrooms: **Semi Gloss Enamel** at walls and ceilings.
2. Drywall soffits: **Eggshell Enamel**.
3. Typical masonry (CMU): **Gloss Enamel.**
4. Masonry (CMU) in toilet rooms: **Gloss Epoxy.**
5. Steel railings: **Gloss Aliphatic Urethane.**
6. Suspended rigging over stage: **Dry Fog.**

B. SYSTEM DESCRIPTIONS (Reference item 3.3 for modifications and preparation required for these systems when applied to existing walls already painted):

1. Primer on gypsum board: SW PrepRite High Build Primer B28W601 – one coat over light to medium texture (submit texture sample for approval)
2. Eggshell Enamel on Drywall: SW Pro Mar 400 Latex Eg-Shel B20W4400 – one coat over specified primer.
3. Semi-Gloss Enamel on Drywall: SW Pro Mar 400 Latex Semi Gloss B31W4400 - one coat over specified primer.
4. Epoxy Paint on Drywall: One coat SW PrepRite 200 Latex Primer B28W200 over specified primer.
5. Gloss Enamel on Drywall: Two coats SW Water Based Catalyzed Epoxy B70 Series gloss acrylic over specified primer.
6. Semi-Gloss Enamel on shop-primed metals: SW Water Based Industrial Enamel B53-300 acrylic gloss Enamel – two coats.
7. Natural Finish on Wood: SW Sherwood BAC Wiping Stain (one coat) + SW Wood Classics Sanding Sealer B26V3 (one coat) + SW Wood Classics Satin Varnish A66.
8. Clear Finish on Wood: SW Wood Classics Polyurethane Varnish A67 (two coats). Sand lightly between all coats.
9. Block Filler: SW Prep Rite Block Filler B25W25 (for areas not subject to moisture); SW Heavy Duty Block Filler (for areas subject to moisture). Provide 2 coats as specified under “Execution”.

10. Gloss Enamel on CMU or concrete: Two coats block filler plus two coats SW Water based Industrial Enamel gloss acrylic latex over specified primer.
11. Semi-Gloss Enamel on CMU or concrete: Two coats block filler plus two coats SW Water Based Industrial Enamel semi-gloss acrylic latex over specified primer.
12. Semi-Gloss Epoxy Paint on concrete: One coat SW Water Based Epoxy semi-gloss over cured concrete plus finish coat of SW Water Based Epoxy semi-gloss. Minimum paint thickness 3.0 dry mils.
13. Gloss Epoxy Paint on CMU: Two coats block filler (unless surface-bonded) plus finish coat of gloss. Minimum paint thickness 3.0 dry mils.
14. Gloss Epoxy Paint on concrete: One coat SW Water Based Epoxy gloss over cured concrete plus finish coat of SW Water Based Epoxy gloss. Minimum paint thickness 3.0 dry mils.
15. Semi-Gloss Enamel on utility piping and galvanized metals: SW Pro-Cryl Universal Metal Primer – one coat + SW DTM Acrylic Semi Gloss – two coats.
16. Semi-Gloss Epoxy Paint on CMU: Two coats block filler plus finish coat of SW Water Based Epoxy semi-gloss. Minimum paint thickness 3.0 dry mils.
17. Gloss Aliphatic Urethane Enamel on primed steel railings: Over epoxy shop primer apply two coats SW Hydrogloss Single Component Water Based Urethane B65-181 Urethane Gloss Enamel using airless spray equipment.
18. Dry Fall Acrylic (exposed deck, structure and rigging): One coat SW Super Save Lite Acrylic Dry Fall Eggshell Primer & Finish. Black color. Overspray dries to non-adhering dust in a ten foot fall.

2.3 EXTERIOR SYSTEMS

A. SYSTEM TYPES:

1. Exterior Metals: **Gloss Enamel.**
2. Field welds: **Zinc-Rich Coating.**

B. SYSTEM DESCRIPTION:

1. Gloss Enamel on Galvanized Metals: SW Pro-Cryl Universal Metal Primer B66W310 (one coat) + SW Sher-Cryl HPA B66-300 enamel – two coats.
2. Block Filler on CMU: SW Heavy Duty Block Filler B24W46, one coat.
3. Gloss Enamel on Shop-Primed Metals: SW Sher-Cryl HPA B66-300 gloss enamel-two coats.
4. Gloss Enamel on Aluminum: SW Pro-Cryl Universal Metal Primer B66W310 – (one coat) + SW Sher-Cryl HPA B66-300 gloss enamel – two coats.
5. Field Welds: "ZRC" cold-applied galvanizing.

PART 3 - EXECUTION

3.1 PREPARATION

A. METALS: Remove grease, oil, and dirt. Touch-up any damaged primer with like material. Remove any welding tags and grind smooth before painting. Fill any open galvanizing ports.

B. PLASTER, CMU, CONCRETE: Remove dusting and mortar residue. Remove any efflorescence and seal. Ensure that plaster, concrete and mortar joints are dry and fully cured.

3.2 APPLICATION

A. GENERAL: All paint and finishes be brushed or sprayed in even, uniform coats without runs or sags. Allow each coat to dry completely before applying succeeding coats. All surfaces shall be dry and no painting shall be done in damp conditions or when the ambient temperature is below 50 degrees F.

B. WOOD DOORS: Factory sealed tops, bottoms, and edges of plastic laminate surfaced doors left undisturbed require no additional finishing. Reseal any job cuts. Paint metal glazing stops.

C. MECHANICAL/ELECTRICAL EQUIPMENT: Painting contractor shall examine the mechanical and electrical drawings to determine quantities and locations of exposed piping, louvers not shown in Architectural drawings, electrical and telephone panels in finished areas, exposed electrical conduit in finished areas.

D. BLOCK FILLER AT CMU: Apply **first coat** of filler to ensure penetration into voids and work into block texture with bristle brush. Follow with a **minimum of one additional coat.** Provide uniform finish with no pinholes.

E. DRYWALL: Paint finish, sheen and texture shall be uniform and match the samples submitted to and approved by the Architect.

3.3 PREPARATION OF EXISTING PAINTED SURFACES

A. Maintenance painting will frequently not permit or require complete removal of all old coatings prior to repainting. However, all surface contamination such as oil, grease. Loose paint, mill scale dirt, foreign matter, rust, mold, mildew, mortar, efflorescence, and sealers must be removed to assure sound bonding to the tightly adhering old paint. Glossy surfaces of old paint films must be clean and dull before repainting. Thoroughly washing with an abrasive cleanser will clean and dull in one operation, or, wash thoroughly and dull by sanding. Spot prime any bare areas with an appropriate primer. Recognize that any surface preparation short of total removal of the old coating may compromise the service length of the system. Check for compatibility by applying a test patch of the recommended coating system, covering at least 2 to 3 square feet. Allow to dry one week before testing adhesion per ASTM D3359. If the coating system is incompatible, complete removal is required.

PART 4 – SCHEDULES

4.1 COLOR SELECTIONS

A. SCHEDULE: Unless colors are pre-selected in the Bidding Documents, the Architect shall prepare color schedule for the project using colors selected from the approved paint manufacturer(s). Where colors are pre-selected, the painting contractor shall use the colors selected or submit a schedule of proposed exact color matches by one of the specified paint manufacturers. **Provide 12” x 12” samples of actual paint for each color** whether pre-selected color or proposed color match.

B. DOCUMENTATION: Upon completion of the Project, painting contractor shall furnish to the Architect a complete schedule of paint brands, types, and colors actually used for each room and area.

4.2 EXTRA MATERIALS

B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Furnish quantity not less than 5 percent for each color (field and accent) of paint used.

END OF SECTION

SECTION 10 14 00 — GRAPHICS AND SIGNAGE

PART 1 - GENERAL

1.1 COORDINATION:

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Material and installation for the Plastic Room Identification Plaques.

B. Material and Installation for Exterior/Interior Building Identification Letters.

C. Material and Installation For Building Dedication Plaque with logos (including but not limited to conversion of architectural drawings into useable vector line art format).

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Interior wall materials and finishes.

B. Exterior wall materials and finishes.

C. Typical handicapped site signage.

1.4 SUBMITTALS

A. Submit manufacturer’s product data describing materials, and mounting methods for Room Identification Plaques, Exterior/Interior Building Identification Letters, and Building Dedication Plaque.

B. Submit color samples of actual material for color and finish selection by Architect.

C. Submit finished sample of room identification plaque(s) with any required symbols other than text.

D. Submit paper “rubbing” of final layout of Building Dedication Plaque for Architect’s approval.

E. Submit full size paper layout of Exterior Building Identification Letters for each line of text.

F. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

B. Warranted defects shall include but not necessarily be limited to color fading, delamination, failure of anchoring or fastening, cracking, breaking or tarnishing.

C. Exterior signage or building letters contributing to streaking or staining of building shall be a defect to be corrected by the Contractor, with building materials cleaned or replaced as required.

1.6 QUALITY ASSURANCE

A. Fabrication and installation company shall have a minimum of 3 years experience in the installation of similar systems for projects of similar size and scope.

1.7 DELIVERY, STORAGE AND HANDLING

A. Do not deliver materials to the jobsite until surfaces are ready for installation of graphics.

B. Store materials in covered, dry, temperature and humidity controlled space.

2 PART TWO – PRODUCTS

2.1 MANUFACTURERS

A. ROOM IDENTIFICATION PLAQUES:
   1. Corpus Christi Stamp Works
   2. Sign International
   3. Multi-Graphics Incorporated

B. EXTERIOR BUILDING IDENTIFICATION LETTERS:
   1. A.R.K. Ramos
   2. Gemini Inc.
   3. Matthews Architectural Products
   4. Sign International

C. BUILDING DEDICATION PLAQUE:
   1. A.R.K. Ramos
   2. Matthews Architectural Products
   3. The Southwell Co.
   4. Sign International

2.2 MATERIALS

A. ROOM IDENTIFICATION PLAQUES:
   1. 6” X 9” X ¼” thick two tone series:
   2. Fabrication: Constructed of Wilson Art face laminate (as selected by the Architect from manufacturer’s standard selections) laminated to a solid acrylic core. The raised 1/32” acrylic copy

shall be cut through the laminate face color and chemically welded to the acrylic core to assure permanent attachment, including the symbols. Any lower and secondary copy shall be 5/8" high Helvetica Medium (all caps) incised copy paint filled. Colors as selected by the Architect. Any secondary copy shall be 8-stroke computer engraved. Rounded corner letters will not be acceptable. The edge of the signs shall be finished to match the face laminate color-to-color as selected by the Architect.

3. At toilet rooms also provide with 2" high raised gender and wheelchair symbols when handicapped equipped noted on schedule. Symbols shall be chemically welded through the face laminate to the acrylic core. Edges painted a color as selected.
4. The raised copy shall be accompanied with grade 2 Braille by means of Visi Touch DuraDot Braille manufacturing system. The clear Glass DuraDot shall have a 0.059 surface diameter and raised 1/32" above the face laminate and shall be unitized to the acrylic core through the face laminate. The edges of the sign shall be finished to match the face laminate color-to color as selected by the Architect. Any secondary copy shall be 8-stroke computer engraved. Rounded corner letters will not be acceptable.
5. Installed plaques shall comply with all state, local, and federal requirements for compliance.

B. EXTERIOR BUILDING IDENTIFICATION LETTERS

1. Scope: The project shall include a cast letters as described below, to be provided and installed by contractor. Letterstyle, finish and mounting to be selected by Architect.

2. Fabrication of Letters: Fabricate letters to comply with requirements indicated below and as indicated on drawings.

   A . Cut letters : Form letters by cutting from solid sheet material of thickness specified. Produce characters with smooth flat faces, sharp corners, precisely formed lines and profiles, free from pits, scale, sand holes and other defects. Supply anchoring devices on reverse side of individual letters as required.

3. Characteristics:
   A. Metal: Aluminum
   B. Size: 6 inches unless noted otherwise on drawings.
   C. Thickness: 1 1/2 inches.
   D. Letterstyle: Sans Serif
   E. Finish: As selected by Architect from manufacturer's finish options (submit samples).
   F. Mounting: Concealed (refer to drawings for wall type).
   G. Text: " RESTROOMS "

4. Template: Provide full size paper mounting template showing hole placement and location of mounting holes.

5. Finishes: Colors and surface textures for exposed letters as selected by the architect from the manufacturer's standard and ***premium*** selections.

C. BUILDING IDENTIFICATION PLAQUE:

1. 18" wide X 24" high cast bronze alloy plaque. Borders and raised text shall have satin finish. Background shall receive a dark oxidized leatherette finish. Faces and edges to be chemically cleaned and sprayed with two coats of clear acrylic lacquer.

2. Provide threaded stainless steel or brass studs on back for concealed mounting with epoxy. Letter style "Helvetica Medium" per A.R. Ramos or equivalent by specified manufacturer.

3. Layout, logos and letter sizes to be provided by the Architect. General contractor shall perform all conversions of architectural drawings & logos into useable vector line art format or any other type of format as required in order to produce the building plaque layout as provided by the Architect.

3 PART THREE- EXECUTION

3.1 INSPECTION AND PREPARATION

A. Ensure that wall surfaces are completed and accepted by the Architect prior to installing wall-mounted items or painted wall graphics.

B. Obtain approved location schedule for Room Identification Plaques prior to delivery of plaques to the jobsite.

3.2 INSTALLATION

A. ROOM IDENTIFICATION PLAQUES:

1. Apply top and bottom strips of 1/8” thick double stick vinyl foam tape and backs of each plaque. Apply liberal amount of clear silicone rubber adhesive to a minimum of 50% coverage of back of plaque.

2. Plaques shall be mounted to the strike side of the door on the wall within 5’ of the floor and 6” max. from the jamb; when location is on a glass side light or window, mount with a solid color back-up plate to cover reverse side of the glass. Attachment shall be with foam tape and silicone.

B. BUILDING DIRECTIONALS SIGNS:

1. Apply top and bottom strips 1/8” thick double stick vinyl foam tape on backs of each sign. Apply liberal amount of clear silicone rubber adhesive to a minimum of 50% coverage of back of sign.

2. Signs shall be mounted to the strike side of the door on the wall within 5’ of the floor and 6” max. from the jamb; when location is a glass sidelight or window, mount with a solid color back-up plate to cover reverse side of the glass. Attachment shall be with foam tape and silicone.

C. EXTERIOR/INTERIOR BUILDING IDENTIFICATION LETTERS.

1. Pre-drill holes into masonry and insert threaded stud on back of letters into epoxy adhesive filled holes. Provide stainless steel spaces to set letters off wall ½” minimum 2 studs per letter. Refer to drawings for wall finish type.

D. BUILDING IDENTIFICATION PLAQUE:

1. Masonry Wall: Pre-drill holes into masonry walls and insert threaded studs on back of letters into epoxy adhesive filled holes. Mount plaque tight against wall.

2. Drywall: Mount plaque using a minimum of 4 moly type expansion screws and silicone adhesive. Mount plaque tight against wall.

END OF SECTION

SECTION 10 21 13 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide and install **cmu toilet partition system and urinal screens** as indicated in the drawings, the approved shop drawings and as specified herein.

B. Provide and install all toilet room and shower accessories as indicated in the drawings and as specified herein.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Wood blocking between studs.

B. Wall and floor finishes.

C. Electrical power provided.

1.4 SUBMITTALS

A. CMU PARTITION SYSTEMS:
   1. Submit shop drawings for cmu partition system indicating plan and elevation dimensions and mounting details. Submit hardware samples and full chain of plastic laminate samples for partition doors.
   2. Shop drawings indicating handicapped stall layouts not meeting State and Federal requirements will be returned and rejected without review.

B. ACCESSORIES:
   1. Submit manufacturer’s product data describing size, type, finish and installation requirements for each item.
   2. Indicate mounting heights for each item. Meet State and Federal requirements for the handicapped.

C. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

B. Warranted defects shall include but not necessarily be limited to delamination of facing or edging, swelling of core, change in alignment of parts, failure of anchorage or fasteners.

C. Provide manufacturer's extended written warranty for systems and accessories where available.

1.6 QUALITY ASSURANCE

A. Partition system installation company shall have a minimum of 5 years experience in the installation of similar system for projects of similar size and scope.

B. Partition system installation company shall be authorized by the system manufacturer for this installation.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver partition system materials to the job site in manufacturer's original packaging.

B. Store materials in covered, dry, temperature and humidity controlled space.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. STAINLESS STEEL PARTITION SYSTEMS:
1. General Partitions
2. Bobrick Washroom Equipment
3. American Specialties, Inc.
4. Ampco

B. ACCESSORY MANUFACTURERS:
1. Bobrick Washroom Equipment
2. Bradley Wash Fountain Co.

C. PAPER TOWEL DISPENSERS:
1. Bobrick Washroom Equipment

D. ELECTRIC HAND DRYERS:
1. Bobrick Washroom Equipment
2. World Dryer Corporation

2.2 TOILET ROOM ACCESSORIES:

1. Grab bars: Furnish and install grab bars at each handicapped toilet stall. Bars shall be Bobrick No. B-6806 series, 1-1/2" outside diameter, satin finish stainless steel, configuration as indicated on the drawings, 1-1/2" clear to wall. **Where bars are mounted over back of toilet, General Contractor shall hold flush valve low.**

2. Mirrors: Mirrors shall be Stretcher leveled stainless steel, highly polished strip finish. Tempered Masonite backing. Frame: Type 430 stainless steel.

a. Flat mirrors shall be Bobrick No. B-1656 screw locking design or equivalent by specified manufacturer.

3. Mop Holder: Bobrick B223X24 stainless steel. Furnished and installed by Contractor.

4. Soap dispensers: Bobrick Contura Series Surface Mounted Soap Dispenser Model B-4112. Furnished and installed by Contractor.

5. Tissue dispensers: ClassicSeries Surface-Mounted Toilet Tissue Dispenser for Two Rolls Model B-265 of Bobrick Washroom Equipment, Inc. Furnished and installed by Contractor.

2.3 ELECTRIC HAND DRYERS:

1. Hand Dryers:
   a. Provide and install No. B-750 115V Recessed Aircraft Automatic Hand Dryer, as manufactured by Bobrick or equivalent by specified manufacturer. Fixed outlet.
   b. Provide units wired for 115 volt AC, 20 amps, unless electrical drawings provide other power.

2.4 MASONRY TOILET STALL DOORS

2.4.1 MATERIALS

A. Stainless steel ceiling hung partitions.

B. Doors and panels shall be 1” thick, constructed of two sheets of 22-gauge stretcher-leveled quality stainless steel formed and bonded under pressure with a non-toxic adhesive to a resin-impregnated, sound-deadening full-face honeycomb core.

C. Pilasters shall be 1-1/4”, constructed of two sheets of 18-gauge stainless steel, formed and bonded under pressure with a non-toxic adhesive to a full resin-impregnated, sound-deadening full-face honeycomb core.

2.4.2 CONSTRUCTION

A. Doors and panels shall be 1” thick. Edges shall be sealed with a 22-gauge stainless steel interlocking molding. Molding corners shall be welded to each other and to face sheets, and ground smooth to form a rigid frame around the component.

B. Pilasters shall be 1-1/4”, constructed of two sheets of 18-gauge stainless steel, formed and bonded under pressure with a non-toxic adhesive to a resin-impregnated, sound-deadening full-face honeycomb core. Vertical edges shall be sealed with 22-gauge stainless steel interlocking molding. The bottom of each pilaster shall be sealed with a 22-gauge stainless steel interlocking molding. An 11-gauge slotted stirrup bracket shall be integrally welded in to top of each pilaster. Two 3/8” diameter by 6” long cadmium-plated studs anchor the mounting bracket to overhead structural steel members. A shoe shall conceal each ceiling mounting, having an internal cross section conforming to the pilaster, and being formed of type 304 stainless steel #4 finish.

2.4.3. HARDWARE

A. All exposed door hardware shall be as noted: Continuous stainless steel hinge. Door hardware shall include a coat hook, bumper, stop, keeper a concealed latch with emergency access and stainless steel vandal resistant fasteners.

B. Panel and pilaster brackets shall be as noted: Continuous heavy duty stainless steel wall brackets are predrilled. Wall brackets are mounted with stainless steel vandal resistant fasteners. The attachment of brackets to the adjacent wall construction shall be accomplished with 2 ½" stainless steel vandal resistant screws and plastic anchors.

C. Colors: A sample of #4 satin finish stainless steel and hardware samples shall be submitted for approval to the architect.

PART 3 - EXECUTION

3.1 INSPECTION

A. Ensure that Contractor has properly installed solid wood blocking between studs at all mounting points.

B. Ensure that Contractor has provided coordinated electrical power at each electric dryer location.

3.2 INSTALLATION

A. Install accessories and partition systems in accordance with the project drawings, approved shop drawings and as specified herein. Use tamper proof stainless steel fasteners for all items.

B. ACCESSORIES:
1. Install through finished stud walls into solid wood blocking with stainless steel one-way screws. No plastic anchors.
2. Attach to masonry walls using stainless steel machine screws in lead shield anchors.

C. PARTITION SYSTEMS AND URINAL SCREENS:
1. Mount channels using stainless steel one-way screws through finished stud walls into solid wood blocking.
2. Mount channels to masonry walls using stainless steel machine screws in lead shield anchors.
3. Job measure for proper fit and to ensure that the maximum space between edge of any pilaster or panel and its adjacent surface is one inch.
4. Install pilaster, doors and panels plumb and square. Adjust doors for gravity closing.

D. FRAMED MIRRORS:
1. Mirrors shall be installed with theft-proof anchors at height shown on drawings. Furnish tilted mirrors where shown.
2. Install mirrors at other locations in addition to toilet rooms as indicated in the drawings.

3. Unframed mirrors are provided and installed under another section of these specifications.

E. MASONRY TOILET STALL DOORS

1. PREPARATION:

a. Examine areas to receive toilet compartments for correct height and spacing of anchorage/blocking and plumbing fixtures that may affect installation of compartments. Report any discrepancies to the architect.

b. Take complete and accurate measurements of toilet compartment locations.

c. Start of work constitutes acceptance of job.

2. INSTALLATION:

a. Install compartments in a rigid, straight, plumb and level manner as shown on the shop drawings and manufacturer's installation instructions.

b. All doors and panels to be mounted at 12" above the finished floor unless otherwise specified.

c. Clearance at vertical edges of door shall be uniform top to bottom. D. No evidence of cutting, drilling and/or patching shall be visible on the finished work. E. Finished surfaces shall be cleaned after installation and be left free of all imperfections.

3. WARRANTY:

a. Global Partitions guarantees its stainless steel units, properly maintained, against corrosion or discoloration for 5 years from the date of receipt by the customer. If materials are found defective during that period for the reasons listed above, the material will be replaced free of charge. No credits or allowances will be issued for any labor or expenses relating to the replacement of components covered under the warranty plan. All such expenses are to be borne by the buyer.

END OF SECTION

SECTION 10 44 00 - FIRE EXTINGUISHERS AND CABINETS

PART 1 GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 RELATED SECTIONS

A. Section 04 22 00 – Concrete Masonry Units; CMU walls to receive bracket mounted fire extinguisher.

B. Section 06 10 00 – Rough Carpentry: Wood blocking and framing to receive semi-recessed fire extinguisher cabinets.

C. Section 09 21 16 – Gypsum Drywall Assemblies: Finished openings in walls for semi-recessed fire extinguisher cabinets.

1.03 REFERENCES

A. NFPA 10 – Standard for Portable Fire Extinguishers; National Fire Protection Association; 2002.

B. UL (FPED) – Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.04 PERFORMANCE REQUIREMENTS

A. Conform to NFPA 10.

B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.05 SUBMITTALS

A. See Section 01 33 00 – Submittals, procedures and requirements for shop drawings, product data and submittal requirements.

B. Shop Drawings: Indicate cabinet physical dimensions.

C. Product Data: Provide extinguisher operational features.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers, Cabinets and Accessories:
1. JL Industries, Inc; Product 1037B20 with Extinguisher: www.jlindustires.com.
2. Larsen's Manufacturing Co: www.larsensmfg.com.
3. Potter-Roemer: www.potterroemer.com.
4. Substitutions: See Section 01 25 00 – Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Basis of Design: JL Industries, "Cosmic 10E".
B. Type: Multipurpose dry chemical.
C. Rating: Sized for project requirements.
D. Mounting: Refer to floor plans for locations, annotated FEC for cabinets and FE extinguishers alone.
E. Dry Chemical Type: Stainless steel tank, with pressure gage.
1. Class A:B:C.
2. Size 10.
3. Finish: Baked enamel, Red color.

G. ALL fire extinguishers shall be inspected and certified by the local authority having jurisdiction that they are charged and ready for use and shall be "tagged" identifying such.

2.03 FIRE EXTINGUISHER CABINETS

A. Basis of Design:
1. JL Industries, "Cosmopolitan – 1035B20 ADAC with Saf-T-Loc, TAS compliant.
2. Designations: Refer to the floor plans, FEC for Extinguishers in cabinets and FE for surface mounted extinguishers secured to walls.

B. Surface Mounted (Non-Cabinet, FE Type) – Bracket and Extinguisher (non-cabinet): Manufacturer's standard stainless steel strap with enamel finished bracket with locking band retainer.
   1. Bracket shall match the extinguisher type.

C. Metal for Cabinets: Formed stainless steel sheet; 0.036 inch thick base metal; #4 finish stainless steel.

D. Cabinet Configuration: Recessed type.

   1. Sized to accommodate accessories.
   2. Exterior nominal dimensions of 13 7/8 inch wide x 27 3/8 inch high x 6 inch deep.
   3. Trim: Returned to wall surface, with 3 inch projection, 1 1/2 inch wide face.
   4. Form cabinet enclosure with right angle inside corners and seams. Form perimeters trim and door stiles.

E. Door: 0.036 inch thick, reinforced for flatness and rigidity; lock with full glass access. Hinge doors for 180 degree opening with two butt hinge. Provide nylon catch.

F. Door Glazing: Glass, clear, 1/8 inch thick float. Set in resilient channel gasket glazing.

G. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.

H. Weld, fill, and grind components smooth.

I. Finish of Cabinet Interior: Enamel, color to select from manufacturer's full color line.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Cabinet Signage: FIRE EXTINGUISHER, vertical up face of cabinet to one side.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install cabinets plumb and level in wall openings, 30 inches from finished floor to inside bottom of cabinet.
C. Secure rigidly in place.
D. Place extinguishers in cabinets.

END OF SECTION

SECTION 31 31 16 - TERMITE CONTROL

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.2 SECTION REQUIREMENTS

A. Submittals: Product Data and product certificates signed by manufacturer certifying that products used comply with U.S. EPA regulations for termiticides. Include application instructions and EPA-Registered Label.

B. Engage a licensed professional pest control operator to apply termite control solution.

PART 2 - PRODUCTS

2.1 TERMITICIDES

A. Provide an EPA-registered termiticide (5 year) complying with requirements of authorities having jurisdiction, in a soluable or emulsible, concentrated formulation that dilutes with water or foaming agent. Use only soil treatment solutions that are not harmful to plants. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA-Registered Label.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare surfaces and apply treatment at rates and concentrations recommended in manufacturer's written instructions.

B. Apply termite control to the following:

1. At foundations. (Piers, mid-span supports)
2. Under sub-floors and flooring materials.

3. Under basement floor slabs.
4. At hollow masonry.
5. At expansion and control joints and slab penetrations.
6. At crawlspaces; treat soil under and adjacent to foundation supports. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment.

C. Post warning signs in areas of application.

D. Reapply soil termiticide treatment solution to areas disturbed by subsequent excavation or other construction activities following application.

END OF SECTION

TRINITY
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8-12-19

DIVISION 22-23 – MECHANICAL

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22 05 29 HANGERS AND SUPPORTS FOR PLUMBING EQUIPMENT
22 05 53 IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT
22 07 19 PLUMBING PIPING INSULATION
22 11 16 DOMESTIC WATER PIPING
22 11 19 DOMESTIC WATER PIPING SPECIALTIES
22 13 13 FACILITY SANITARY SEWERS
22 33 05 ELECTRIC DOMESTIC WATER HEATERS
22 42 00 PLUMBING FIXTURES
22 47 13 ELECTRIC DRINKING FOUNTAIN
23 01 00 SUMMARY OF MECHANICAL WORK
23 05 10 BASIC MECHANICAL MATERIALS AND METHODS
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23 06 01 MECHANICAL IDENTIFICATION
23 31 00 DUCT ACCESSORIES
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DIVISION 26 – ELECTRICAL

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26 01 20 BASIC ELECTRICAL REQUIREMENTS
26 01 26 ELECTRICAL TESTING
26 05 19 LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 05 26 GROUNDING AND BONDING
26 05 29 HANGERS AND SUPPORTS
26 05 33 RACEWAYS AND BOXES
26 05 53 ELECTRICAL IDENTIFICATION
26 05 73 SHORT CIRCUIT COORDINATION STUDY/ARC FLASH HAZARD ANALYSIS
26 09 26 LIGHTING CONTROL SYSTEM
26 27 17 SITE ELECTRICAL
26 24 16 PANELBOARDS
26 27 17 EQUIPMENT WIRING
26 27 26 WIRING DEVICES
26 28 13 FUSES
26 28 18 ENCLOSED SWITCHES
26 43 13 SURGE PROTECTIVE DEVICES FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS
26 51 00 INTERIOR LIGHTING
26 56 00 EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. The following Summary of Work is intended as an aid to achieve an understanding of the various elements of work included in the project, as is not intended to be all-inclusive. Detailed descriptions of work and requirements are given in drawings and specifications.

B. Plumbing Contract Documents were prepared for the Project by:

Trinity MEP Engineering, LLC
3533 Moreland Dr. Ste. A
Weslaco, Texas 78596
Phone Number: (956) 973-0500
Contact Person: Leonardo Munoz, P.E.

C. General Scope of Work:

1. Install systems and equipment as shown on the contract documents. Refer to drawings for schedule of equipment that will be installed. After installing equipment, connect all water, sewer, and/or power to fixtures.

2. Provide all materials and labor associated with a complete operational installation of new systems including, but not limited to:

- Fixtures for facility
- Piping for Sanitary Sewer and Vent Systems
- Piping for Domestic water and Hot Water Systems.

1.2 COORDINATION

A. All plumbing work shall be done under sub-contract to a General Contractor. Plumbing Contractor shall coordinate all work through General Contractor, even in areas where only plumbing work is to take place.

B. Coordination between all trades shall take place on a regular basis to avoid conflicts between disciplines and equipment clearances.

C. Work shall take place with minimal disruption to Owner's operations in areas surrounding the new building.

D. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

E. Fully coordinate with electrical contractor for providing power to plumbing equipment.

1.3 UTILITIES

1. Coordinate with power, water, telephone, cable and gas utilities to locate all utilities prior to digging in any area.

2. Obtain any approvals required from utilities to relocate utilities.
3. Cost of relocating or bypassing utilities indicated on drawings shall be included in Base Bid.

1.4 CONTRACTOR USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
   1. Owner Occupancy: Allow for Owner occupancy and use by the public.

   2. Driveways and Entrances: Keep driveways and entrances serving the premises, clear and available to the Owner, the Owner's employees, and emergency vehicles at all time. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Site Safety: Take every precaution to ensure the site does not present a threat to the safety of occupants and/or workers. Minimal safety requirements include, but are not limited to the following:

   1. Temporary fencing around construction areas.

   2. Yellow caution tape and construction barricades along open trenches during the day. Trenches shall be covered at night and warning lights provided on construction barricades.

   3. Temporary fencing around equipment while site work is in progress.

1.5 SUBMITTALS

1. All equipment and fixtures shall be provided with a submittal.

2. To extradite the submittal process more efficiently, DO NOT piece-meal the submittals. Submit entire plumbing or in a bound enclosure. This will eliminate delays in the submittal process.

.

END OF SECTION

SECTION 22 05 01 COMMON PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Common requirements and procedures for plumbing systems.
   2. Responsibility for proper operation of electrically powered equipment furnished under this Division.
   3. Furnish and install sealants relating to installation of systems installed under this Division.
   4. Furnish and install Firestop Penetration Systems for plumbing systems penetrations as described in Contract Documents.

B. Products Furnished But Not Installed Under This Section:
   1. Sleeves, inserts, supports, and equipment for plumbing systems installed under other Sections.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Manufacturer's catalog data for each manufactured item.
         1) Provide section in submittal for each type of item of equipment. Include Manufacturer's catalog data of each manufactured item and enough information to show compliance with Contract Document requirements. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.
         2) Include name, address, and phone number of each supplier.

B. Informational Submittals:
   1. Qualification Statement:
      a. Plumbing Subcontractor:
         1) Provide Qualification documentation if requested by Architect or Owner.
      b. Installer:
         1) Provide Qualification documentation if requested by Architect or Owner.

C. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Operations and Maintenance Data (Modify and add to requirements of Section 01 7800):
         1) At beginning of PLUMBING section of Operations And Maintenance Manual, provide master index showing items included:
            a) Provide name, address, and phone number of Architect, Architect's Mechanical Engineer, General Contractor, and Plumbing subcontractor.
            b) Identify maintenance instructions by using same equipment identification used in Contract Drawings. Maintenance instructions shall include:
               (1) List of plumbing equipment used indicating name, model, serial number, and nameplate data of each item together with number and name associated with each system item.
               (2) Manufacturer’s maintenance instructions for each piece of plumbing equipment installed in Project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance instructions.
            c) Provide operating instructions to include:
               (1) General description of fire protection system.

(2) Step by step procedure to follow for shutting down system or putting system into operation.

b. Warranty Documentation:
1) Include copies of warranties required in individual Sections of Division 22.

1.3 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
1. Perform work in accordance with applicable provisions of Plumbing Codes applicable to Project. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
2. In case of differences between building codes, laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Notify Architect in writing of such differences before performing work affected by such differences.
3. Identification:
a. Motor and equipment name plates as well as applicable UL / ULC and AGA / CGA labels shall be in place when Project is turned over to Owner.

B. Qualifications.
1. Plumbing Subcontractor:
a. Company specializing in performing work of this section.
1) Minimum five (5) years experience in plumbing installations.
2) Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
b. Upon request, submit documentation.
2. Installer:
a. Licensed for area of Project.
b. Designate one (1) individual as project foremen who shall be on site at all times during installation and experienced with installation procedures required for this project.
c. Upon request, submit documentation.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
1. Accept valves on site in shipping containers with labeling in place.
2. Provide temporary protective coating on cast iron and steel valves.
3. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

B. Storage And Handling Requirements:
1. In addition to requirements specified within, stored material shall be readily accessible for inspection by Architect/engineer until installed.
2. Store items subject to moisture damage in dry, heated spaces.

1.5 WARRANTY

A. Manufacturer Warranty:
1. Provide certificates of warranty for each piece of equipment made out in favor of Owner.

B. Special Warranty:
1. Guarantee plumbing systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.
2. If plumbing sub-contractor with offices located more than 150 miles (240 km) from Project site is used, provide service / warranty work agreement for warranty period with local plumbing sub-contractor approved by Architect. Include copy of service / warranty agreement in warranty section of Operation And Maintenance Manual.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Components shall bear Manufacturer's name and trade name. Equipment and materials of same general type shall be of same make throughout work to provide uniform appearance, operation, and maintenance.

B. Pipe And Pipe Fittings:
   1. Weld-O-Let and Screw-O-Let fittings are acceptable.
   2. Use domestic made pipe and pipe fittings on Project, except non-domestic made cast iron pipe and fittings by MATCO-NORCA are acceptable.

C. Sleeves:
   1. General:
      a. Two sizes larger than bare pipe or insulation on insulated pipe.
   2. In Concrete And Masonry:
      a. Sleeves through outside walls, interior shear walls, and footings shall be schedule 80 black steel pipe with welded plate.
   3. In Framing And Suspended Floor Slabs:
      a. Standard weight galvanized iron pipe, Schedule 40 PVC, or 14 ga (2 mm) galvanized sheet metal.

D. Valves:
   1. Valves of same type shall be of same manufacturer.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Acceptable Installers:
   1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.2 EXAMINATION

A. Drawings:
   1. Plumbing Drawings show general arrangement of piping, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
   2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Plumbing Drawings.
   3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.

B. Verification Of Conditions:
   1. Examine premises to understand conditions that may affect performance of work of this Division before submitting proposals for this work. Examine adjoining work on which plumbing work is dependent for efficiency and report work that requires correction.
   2. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items,

be responsible for specified capacities and for ensuring that items to be furnished will fit space available.
3. Check that slots and openings provided under other Divisions through floors, walls, ceilings, and roofs are properly located. Perform cutting and patching caused by neglecting to coordinate with Divisions providing slots and openings at no additional cost to Owner.
4. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

3.3 PREPARATION

A. Demolition Requirements:
1.

B. Changes Due To Equipment Selection:
1. Where equipment specified or otherwise approved requires different arrangement or connections from that shown in Contract Documents, submit drawings showing proposed installations.
2. If proposed changes are approved, install equipment to operate properly and in harmony with intent of Contract Documents. Make incidental changes in piping, ductwork, supports, installation, wiring, heaters, panelboards, and as otherwise necessary.
3. Provide additional motors, valves, controllers, fittings, and other equipment required for proper operation of systems resulting from selection of equipment.
4. Be responsible for proper location of rough-in and connections provided under other Divisions.

3.4 INSTALLATION

A. Interface With Other Work:
1. Furnish exact location of electrical connections and complete information on motor controls to installer of electrical system.
2. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and confirm that they are properly installed.
3. Furnish inserts for attaching hangers that are to be cast in concrete floor construction at time floors are poured.

B. Cut carefully to minimize necessity for repairs to previously installed or existing work. Do not cut beams, columns, or trusses.

C. Locating Equipment:
1. Arrange pipes and equipment to permit ready access to valves, cocks, unions, traps, and to clear openings of doors and access panels.
2. Adjust locations of pipes, equipment, and fixtures to accommodate work to interferences anticipated and encountered.
3. Install plumbing work to permit removal of equipment and parts of equipment requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
4. Determine exact route and location of each pipe before fabrication.
    a. Right-Of-Way:
        1) Lines that pitch shall have right-of-way over those that do not pitch. For example, plumbing drains shall normally have right-of-way.
        2) Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
    b. Offsets, Transitions, and Changes in Direction:
        1) Make offsets, transitions, and changes in direction in pipes as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
        2) Furnish and install all traps, air vents, sanitary vents, and devices as required to effect these offsets, transitions, and changes in direction.

D. Penetration Firestops:
   1. Install Penetration Firestop System appropriate for penetration at plumbing systems penetrations through walls, ceilings, roofs, and top plates of walls.

E. Sealants:
   1. Seal openings through building exterior caused by penetrations of elements of plumbing systems.
   2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.

F. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus:
   1. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper installation of plumbing systems.
   2. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings:
      a. Arrange so as to facilitate removal of tube bundles.
      b. Provide accessible flanges or ground joint unions, as applicable for type of piping specified, at connections to equipment and on bypasses.
         1) Make connections of dissimilar metals with di-electric unions.
         2) Install valves and unions ahead of traps and strainers. Provide unions on both sides of traps.
      c. Do not use reducing bushings, bull head tees, close nipples, or running couplings. Street elbows are allowed only on potable water pipe 3/4 inch (19 mm) in diameter and smaller.
      d. Install piping systems so they may be easily drained
      e. Install piping to insure noiseless circulation.
      f. Place valves and specialties to permit easy operation and access. Valves shall be regulated, packed, and glands adjusted at completion of work before final acceptance.
   3. Do not install piping in shear walls.
   4. Cut piping accurately to measurements established at site. Remove burr and cutting slag from pipes.
   5. Work piping into place without springing or forcing. Make piping connections to pumps and other equipment without strain at piping connection. Remove bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected, if requested.
   6. Make changes in direction with proper fittings.
   7. Expansion of Thermoplastic Pipe:
      a. Provide for expansion in every 30 feet of straight run.
      b. Provide 12 inch offset below roof line in each vent line penetrating roof.
   8. Expansion of PEX Pipe: Allow for expansion and contraction of PEX pipe as recommended by Pipe Manufacturer.

G. Sleeves:
   1. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete slabs on grade (unless noted on plans).
   2. Provide sleeves around pipes passing through concrete or masonry floors, walls, partitions, or structural members. Seal sleeves with specified sealants. Follow Pipe Manufacturer's recommendations for PEX pipe (if used) penetrations through studs and floor slabs.
   3. Sleeves through floors shall extend 1/4 inch above floor finish in mechanical equipment rooms above basement floor. In other rooms, sleeves shall be flush with floor.
   4. Sleeves through floors and foundation walls shall be watertight.

H. Escutcheons:
   1. Provide spring clamp plates where pipes run through walls, floors, or ceilings and are exposed in finished locations of building. Plates shall be chrome plated heavy brass of plain pattern and shall be set tight on pipe and to building surface.

3.5 REPAIR / RESTORATION

A. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it:
   1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown.
   2. Surface finishes shall exactly match existing finishes of same materials.

3.6 FIELD QUALITY CONTROL

A. Field Tests:
   1. Perform tests on plumbing piping systems. Furnish devices required for testing purposes.

B. Non-Conforming Work:
   1. Replace material or workmanship proven defective with sound material at no additional cost to Owner.
   2. Repeat tests on new material, if requested.

3.7 CLEANING

A. Remove dirt, grease, and other foreign matter from each length of piping before installation:
   1. After each section of piping used for movement of water or steam is installed, flush with clean water, except where specified otherwise.
   2. Arrange temporary flushing connections for each section of piping and arrange for flushing total piping system.
   3. Provide temporary cross connections and water supply for flushing and drainage and remove after completion of work.

B. Clean exposed piping, equipment, and fixtures. Remove stickers from fixtures and adjust flush valves.

3.8 CLOSEOUT ACTIVITIES

A. Instruction of Owner:
   1. Instruct building maintenance personnel in operation and maintenance of plumbing systems utilizing Operation And Maintenance Manual when so doing.
   2. Conduct instruction period after Substantial Completion inspection when systems are properly working and before final payment is made.

3.9 PROTECTION

A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Common hanger and support requirements and procedures for plumbing systems.

B. Products Installed But Not Furnished Under This Section:
   1. Paint identification for gas piping used in HVAC equipment.

1.2 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Manufacturer's catalog data for each manufactured item.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

A. Manufacturers:
   1. Manufacturer Contact List:
      a. Anvil International,
      b. Cooper B-Line,
      c. Unistrut, Wayne,

B. Materials:
   1. Hangers, Rods, And Inserts
      a. Galvanized and UL approved for service intended.
      b. Support horizontal piping from hangers or on roller assemblies with channel supports, except where trapeze type hangers are explicitly shown on Drawings. Hangers shall have double nuts.
         1) Support insulated pipes 2 inches in diameter and smaller with adjustable swivel ring hanger with insulation protection shield. Gauge and length of shield shall be in accordance with Anvil design data.
            a) Type Two Acceptable Products:
               (1) Swivel Ring Hanger: Anvil Fig. 69.
               (2) Insulation Protection Shield: Anvil Fig. 167.
               (3) Equals by Cooper B-Line.
         2) Support insulated pipes 2-1/2 inches in diameter and larger with clevis hanger or roller assembly with an insulation protection shield. Gauge and length of shield shall be according to Anvil design data.
            a) Type Two Acceptable Products:
               (1) Clevis Hanger: Anvil Fig. 260.
               (2) Roller Assembly: Anvil Fig. 171.
               (3) Insulation Protection Shield: Anvil Fig. 167.
               (4) Equals by Cooper B-Line.
         3) Support uninsulated copper pipe 2 inches in diameter and smaller from swivel ring hanger, copper plated and otherwise fully suitable for use with copper tubing. Support non-copper uninsulated pipes from swivel ring hanger.

a) Type Two Acceptable Products:
(1) Swivel Ring Hanger For Copper Pipe: Anvil Fig. CT-69.
(2) Swivel Ring Hanger For Other Pipe: Anvil Fig. 69.
(3) Equals by Cooper B-Line.

4) Support uninsulated copper pipe 2-1/2 inches in diameter and larger from clevis hanger, copper plated hangers and otherwise fully suitable for use with copper tubing. Support non-copper uninsulated pipes from clevis hanger.
a) Type Two Acceptable Products:
(1) Clevis Hanger For Copper Pipe: Anvil Fig. CT-65.
(2) Clevis Hanger For Other Pipe: Anvil Fig. 260.
(3) Equals by Cooper B-Line.

c. Support rods for single pipe shall be in accordance with following table:

Rod Diameter	Pipe Size
3/8 inch	2 inches and smaller
1/2 inch	2-1/2 to 3-1/2 inches
5/8 inch	4 to 5 inches
3/4 inch	6 inches
7/8 inch	8 to 12 inches

d. Support rods for multiple pipe supported on steel angle trapeze hangers shall be in accordance with following table:

Rods		Number of Pipes per Hanger for Each Pipe Size						
Number	Diameter	2 Inch	2.5 Inch	3 Inch	4 Inch	5 Inch	6 Inch	8 Inch
2	3/8 Inch	Two	0	0	0	0	0	0
2	1/2 Inch	Three	Three	Two	0	0	0	0
2	5/8 Inch	Six	Four	Three	Two	0	0	0
2	5/8 Inch	Nine	Seven	Five	Three	Two	Two	0
2	5/8 Inch	Twelve	Nine	Seven	Five	Three	Two	Two

1) Size trapeze angles so bending stress is less than 10,000 psi

e. Riser Clamps For Vertical Piping:
1) Type Two Acceptable Products:
a) Anvil Fig. 261.
b) Equals by Cooper B-Line.

f. Concrete Inserts:
1) Individual Inserts:
a) Suitable for special nuts size 3/8 inch through 7/8 inch with yoke to receive concrete reinforcing rods, and with malleable iron lugs for attaching to forms.
b) Type Two Acceptable Products:
(1) Anvil Fig. 282.
(2) Equals by Cooper B-Line.
2) Continuous Inserts:
a) Class Two Quality Standard: Equal to Unistrut P-3200 series.

g. Steel Deck Bracket:
1) Class Two Quality Standard: Equal to Unistrut P1000 with clamp nut, minimum 6 inch length.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interface With Other Work: If project contains concrete structural system.
   1. Furnish inserts for attaching hangers that are to be cast in concrete floor construction at time floors are poured.

B. Piping:
   1. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.
      a. Except for underground pipe, suspend piping from roof trusses or clamp to vertical walls using Unistrut and clamps. Do not hang pipe from other pipe, equipment, or ductwork. Laying of piping on any building element is not allowed.
      b. Supports For Horizontal Piping:
         1) Support metal piping at 96 inches on center maximum for pipe 1-1/4 inches or larger and 72 inches on center maximum for pipe 1-1/8 inch or less.
         2) Support thermoplastic pipe at 48 inches on center maximum.
         3) Support PEX pipe at 32 inches minimum on center.
         4) Provide support at each elbow. Install additional support as required.
      c. Supports for Vertical Piping:
         1) Place riser clamps at each floor or ceiling level.
         2) Securely support clamps by structural members, which in turn are supported directly from building structure.
         3) Provide clamps as necessary to brace pipe to wall.
      d. If Structural concrete systems are used: Install supports from inserts cast into concrete floor system, including concrete joists and floor slabs. Where inserts cannot be used, provide expansion shields and support hangers from angles held in place by expansion bolts, never directly from expansion bolt itself. Provide calculations necessary to determine number of expansion bolts required to equal capacity of cast-in-place insert.
      e. Attach Unistrut to structural steel roof supporting structure. Spacing and support as described above.
      f. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.
   2. Gas piping Identification:
      a. Apply paint identification for gas piping used with HVAC equipment as specified in Section 23 0553.

END OF SECTION

SECTION 22 05 53 IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install identification of plumbing piping and equipment as described in Contract Documents.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Materials:
   1. Labels:
      a. Equipment Identification:
         1) Black formica, with white reveal when engraved.
         2) Lettering to be 3/16 inch high minimum.
   2. Paint:
      a. One Coat Primer:
         1) 6-2 Quick Drying Latex Primer Sealer over fabric covers.
         2) 6-205 Metal Primer under dark color paint.
         3) 6-6 Metal Primer under light color paint.
      b. Finish Coats: Two coats 53 Line Acrylic Enamel.
      c. Type Two Acceptable Products.
         1) Paint of equal quality from following Manufacturers may be submitted for Architect's approval before use. Maintain specified colors, shades, and contrasts.
            a) Benjamin Moore,
            b) ICI Dulux,
            c) Sherwin Williams,

PART 3 - EXECUTION

3.1 APPLICATION

A. Labels:
   1. Identify following items with specified labels fastened to equipment with screws (unless noted otherwise):
      a. Water Heaters.
   2. Engrave following data from Equipment Schedules on Drawings onto labels:
      a. Equipment mark.
      b. Room(s) served.
      c. Panel and breaker from which unit is powered.

B. Painting:
   1. Only painted legends, directional arrows, and color bands are acceptable.
   2. Locate identifying legends, directional arrows, and color bands at following points on exposed piping of each piping system:
      a. Adjacent to each item of equipment.
      b. At point of entry and exit where piping goes through wall.
      c. On each riser and junction.
      d. Every 25 feet on long continuous lines.
      e. Stenciled symbols shall be one inch high and black.

3.2 ATTACHMENTS

A. Schedules:

1. Pipe Identification Schedule:
   a. Apply stenciled symbols as follows:

Pipe Use	Abbreviation
Domestic Cold Water	CW
Domestic Hot Water	HW

END OF SECTION

SECTION 22 07 19 PLUMBING, PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install insulation on hot and cold water lines, fittings, valves, and accessories as described in Contract Documents.
   2. Furnish and install insulation on roof drain piping as described in Contract Documents.

1.2 SUBMITTALS

A. Informational Submittals:
   1. Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

   1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.5 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for insulation application.

C. Coordinate installation and testing of steam or electric heat tracing.

1.6 SCHEDULING

A. Schedule insulation application after testing piping systems and, where required, after installing and testing heat-trace tape. Insulation application may begin on segments of piping that have satisfactory test results.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Manufacturers:
1. Manufacturer Contact List:
   a. Armacell, Mebane, NC www.armaflex.com.
   b. Childers Products Co, Eastlake, OH www.fosterproducts.com.
   c. IMCOA, Youngsville, NC www.nomacokflex.com.
   d. Johns-Manville, Denver, CO www.jm.com.
   e. Knauf, Shelbyville, IN www.knauffiberglass.com.
   f. Manson, Brossard, PQ, Canada www.isolationmanson.com.
   g. Nomaco Inc, Yopungsville, NC www.nomacokflex.com.
   h. Owens-Corning, Toledo, OH www.owenscorning.com.
   i. Speedline Corp, Solon, OH www.speedlinepvc.com.
   j. CertainTeed Manson.
   k. Knauf FiberGlass GmbH.
   l. Owens-Corning Fiberglas Corp.
   m. Schuller International, Inc.
   n. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.
   o. Armstrong World Industries, Inc.
   p. Rubatex Corp.

B. Materials:
1. Above Grade Metal Piping:
   a. Insulation For Piping:
      1) Snap-on glass fiber or melamine foam pipe insulation, or heavy density pipe insulation with factory vapor jacket.
      2) Insulation Thickness:

Service Water Temperature	Pipe Sizes Up to 1-1/4 In	1-1/2 to 2 In	Over 2 In
170 - 180 Deg F	One In	1-1/2 In	2 In
140 - 160 Deg F	1/2 In	One In	1-1/2 In
45 - 130 Deg F	1/2 In	1/2 In	One In

      3) Performance Standards:
         Fiberglas ASJ by Owens-Corning.
      4) Type One Acceptable Manufacturers:
         a) Childers Products.
         b) Knauf.
         c) Manson.
         d) Owens-Corning.
         e) Johns-Manville.
         f) Equal as approved by Architect before bidding. See Section 01 6200.
   b. Fitting, Valve, And Accessory Covers:
      1) PVC.
      2) Performance Standard: Zeston by Johns-Manville.
      3) Type One Acceptable Manufacturers:
         a) Knauf.
         b) Speedline.
         c) Johns-Manville.
         d) Equal as approved by Architect before bidding. See Section 01 6200.
2. Below Grade Metal Piping:
   a. Insulation:

1) 1/2 inch (13 mm) thick.
2) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
a) SS Tubolit by Armacell.
b) ImcoLock by Imcoa.
c) Nomalock or Therma-Cel by Nomaco.

b. Joint Sealant:
1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
a) Armacell 520.
b) Nomaco K-Flex R-373.

3. Pex Piping, Above And Below Grade:
a. Insulation:
1) 1/2 inch (13 mm) thick.
2) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
a) SS Tubolit
b) by Armacell.
c) ImcoLock by Imcoa.
d) Nomalock or Therma-Cel by Nomaco.

b. Joint Sealant:
1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
a) Armacell 520.
b) Nomaco K-Flex R-373.
c)

4. PP-R Piping, Above And Below Grade:
a. Insulation:
1) 1/2 inch (13 mm) thick.
2) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
a) SS Tubolit by Armacell.
b) ImcoLock by Imcoa.
c) Nomalock or Therma-Cel by Nomaco.

b. Joint Sealant:
1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
a) Armacell 520.
b) Nomaco K-Flex R-373.

5. PVC or ABS Piping, Above And Below Grade - Facility Storm Drain:
a. Insulation:
1) 1/2 inch (13 mm) thick.
2) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
a) SS Tubolit by Armacell.
b) ImcoLock by Imcoa.
c) Nomalock or Therma-Cel by Nomaco.

b. Joint Sealant:
1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
a) Armacell 520.
b) Nomaco K-Flex R-373.

PART 3 - EXECUTION

3.1 APPLICATION

A. Above Grade Piping:
1. Apply insulation to clean, dry piping with joints tightly butted.
2. Install insulation in manner to facilitate removal for repairs. Place sections or blocks so least possible damage to insulation will result from inspection or repairs of piping or equipment.
3. Piping up to 1-1/4 inch Diameter:
a. Adhere 'factory applied vapor barrier jacket lap' smoothly and securely at longitudinal laps with white vapor barrier adhesive.
b. Adhere 3 inch wide self-sealing butt joint strips over end joints.

4. Piping 1-1/2 inches Diameter And Larger:
    a. Use broken-joint construction in application of two-layer covering.
    b. Fill cracks and depressions with insulating cement mixed to thick plastic paste.
        1) Apply by hand in several layers to make up total specified thickness.
        2) Final layer shall have smooth uniform finish before application of covering.
5. Fittings, Valves, And Accessories:
    a. Do not apply insulation over flanged joints or victaulic couplings until piping has been brought up to operating temperature and flange bolts have been fully tightened. Insulate valves so wheel, stem, and packing nut are exposed.
    b. Insulate with same type and thickness of insulation as pipe, with ends of insulation tucked snugly into throat of fitting and edges adjacent to pipe insulation tufted and tucked in.
    c. Piping Up To 1-1/4 Inch Diameter:
        1) Cover insulation with one piece fitting cover secured by stapling or taping ends to adjacent pipe covering.
        2) Alternate Method:
            a) Insulate fittings, valves, and accessories with one inch of insulating cement and vapor seal with two 1/8 inch wet coats of vapor barrier mastic reinforced with glass fabric extending 2 inches onto adjacent insulation.
    d. Piping 1-1/2 inches To 2 Inches :
        1) Insulate with hydraulic setting insulating cement or equal, to thickness equal to adjoining pipe insulation.
        2) Apply final coat of fitting mastic over insulating cement.
    e. Piping 2-1/2 inch And Larger:
        1) Insulate with segments of molded insulation securely wired in place and coated with skim coat of insulating cement.
        2) Apply fitting mastic, fitting tape and finish with final coat of fitting mastic.
6. Pipe Hangers:
    a. Do not allow pipes to come in contact with hangers.
    b. Pipe Shield:
        1) Provide schedule 40 PVC by 6 inch ong at each clevis and/or unistrut type hanger.
        2) Provide 16 ga by 6 inch long galvanized shields at each pipe hanger to protect pipe insulation from crushing by clevis hanger.
        3) Provide 22 ga by 6 inch long galvanized shield at each pipe hanger to protect insulation from crushing by Unistrut type hanger.
    c. At Pipe Hangers:
        1) Provide rigid calcium silicate insulation (100 psi compressive strength) at least 2 inches beyond shield.
7. Protect insulation wherever leak from valve stem or other source might drip on insulated surface, with aluminum cover or shield rolled up at edges and sufficiently large in area and of shape that dripping will not splash on surrounding insulation.

B. Below Grade Piping:
    1. Slip underground pipe insulation onto pipe and seal butt joints.
    2. Where slip-on technique is not possible, slit insulation, apply to pipe, and seal seams and joints.

3.2 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.4 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

F. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

G. Keep insulation materials dry during application and finishing.

H. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

I. Apply insulation with the least number of joints practical.

J. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

K. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.

1. Apply insulation continuously through hangers and around anchor attachments. Insulation around hanger or pipe clamp will not be acceptable.
2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches (300 mm) from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.

L. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

M. Apply adhesives and mastics at the manufacturer's recommended coverage rate.

N. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Circumferential Joints: Cover with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches (100 mm) o.c.

3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches (40 mm). Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.

    a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.

4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.

O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.
2. Apply insulation for exterior applications tightly joined to interior insulation ends.
3. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal metal jacket to roof flashing with vapor-retarder mastic.

P. Exterior Wall Penetrations: For penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.

Q. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.

R. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.

1. Firestopping and fire-resistive joint sealers are specified in Section "Firestopping."

3.5 MINERAL-FIBER INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet (4.5 to 6 m) to form a vapor retarder between pipe insulation segments.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with standard PVC fitting covers.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded segments of cellular-glass insulation or glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.
2. Apply insulation to flanges as specified for flange insulation application.
3. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
4. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.6 CLOSED-CELL PHENOLIC-FOAM INSUALTION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of the same thickness as pipe insulation.
4. Apply canvas jacket material with manufacturer’s recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturers written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of phenolic-foam insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch (25 mm) at each end. Secure fitting covers with manufacturer’s attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of phenolic-foam insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without distributing insulation.
3. Apply insulation to flanges as specified for flange insulation application.
4. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
5. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.7 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Follow manufacturer's written instructions for applying insulation.
2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

B. Apply insulation to flanges as follows:

1. Apply pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of the same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

C. Apply insulation to fittings and elbows as follows:

1. Apply mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

D. Apply insulation to valves and specialties as follows:

1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.
2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to stainer basket.
3. Apply insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.8 FIELD-APPLIED JACKET APPLICATION

A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.

1. Apply jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of jacket manufacturer's recommended adhesive.
3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

B. Foil and Paper Jackets: Apply foil and paper jackets where indicated.

1. Draw jacket material smooth and tight.
2. Apply lap or joint strips with the same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Apply jackets with 1-1/2-inch (40-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.

C. Apply metal jacket where indicated, with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.9 PIPING SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors.
2. Fire-suppression piping.
3. Drainage piping located in crawl spaces, unless otherwise indicated.
4. Below-grade piping, unless otherwise indicated.
5. Chrome-plated pipes and fittings, unless potential for personnel injury.
6. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.10 INTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Domestic water piping.

1. Operating Temperature: 60 to 80 deg F
2. Insulation Material: Mineral Fiber
3. Insulation Thickness: 1” thick.
4. Field-Applied Jacket: Foil and Paper(ASJ)
5. Vapor Retarder Required: Yes.
6. Finish: None.

B. Service: Domestic hot and recirculated hot water.

1. Operating Temperature: 60 to 140 deg F (15 to 60 deg C).
2. Insulation Material: Mineral fiber
3. Insulation Thickness: 1” thick
4. Field-Applied Jacket: Foil and Paper(ASJ)
5. Vapor Retarder Required: No
6. Finish: None.

C. Service: Condensate and equipment drain piping.

1. Operating Temperature: 40 to 60 deg F
2. Insulation Material: Flexible elastomeric, only on first ten feet of pipe from trap.
3. Insulation Thickness: 3/4”
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: No.
6. Finish: Two coats of the insulation manufacturer’s recommended protective coating.

D. Service: Rainwater conductors.
1. Insulation Material: mineral fiber.
2. Insulation Thickness: 1” thick.
3. Field-Applied Jacket: Aluminum Jacket on building in mechanical rooms only.
4. Vapor Retarder Required: Yes.
5. Finish: None.

E. Service: For obtaining fire/smoke rating in return air plenum (calbes, PE, PB, PP, ABS, PVC, CPVC, etc).

1. Operating Temperature: 35 to 90 deg F
2. Insulation Material: 3M Fire Barrier Plenum Wrap 5 A or equal.
3. Insulation Thickness: larger of 1” or mfr’s recommendations.
4. Field-Applied Jacket: scrim reinforced foil
5. Vapor Retarder Required: None.
6. Finish: None.

3.11 EXTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Domestic water.

1. Operating Temperature: 60 to 140 deg F (15 to 60 deg C).
2. Insulation Material: Mineral fiber.
3. Insulation Thickness: Apply the following insulation thicknesses: 1”
4. Field-Applied Jacket: Aluminum.
5. Vapor Retarder Required: Yes.
6. Finish: None.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform excavating and backfilling required by work of this Section.
   2. Furnish and install potable water piping complete with necessary valves, connections, and accessories inside building and connect with outside utility lines 5 feet from building perimeter as described in Contract Documents.

1.2 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

   1. Domestic Water Distribution Piping: 125 psig..

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: For pipe, tube, fittings, and couplings.
   2. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

B. Informational Submittals:
   1. Test And Evaluation Reports:
      a. Written report of sterilization test.

C. Shop Drawings:
   a. Piping Layout:
      1) Provide as-built drawings at end of project.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.
   2. California only: California Assembly Bill 1953 (AB1953) Compliant for Lead Free.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic, potable domestic water piping and components.

D. Comply with NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Manufacturers:
1. Manufacturer Contact List:
a. Aquatherm, Inc.,
b. Cash Acme,
c. Cla-Val Company,
d. Conbraco Industries Inc,
e. Hammond Valve,
f. Handy & Harmon Products Div,
g. Honeywell Inc,
h. Leonard Valve Co,
i. Milwaukee Valve Co,
j. Nibco Inc,
k. Rehau,
l. Sloan Valve Co,
m. Spence Engineering Co,
n. Symmons Industries, Braintree,
o. Uponor Inc,
p. Viega ProPress, Wic
q. Watts Regulator Co,
r. Wilkins (Zurn Wilkins),
s. Zurn PEX, Inc.

B. Materials:
1. Design Criteria:
a. All drinking water products, components, and materials above and below grade used in drinking water systems must meet NSF International Standards for Lead Free.
b. No CPVC allowed.
2. Pipe:
a. Copper:
1) Above-Grade:
a) Meet requirements of ASTM B88, Type K & L.
b. Hard Copper Tube: ASTM B 88, Types K and L, water tube, drawn tempered.
c. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
d. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
e. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
f. Copper, Grooved-End Fittings: ASTM B 75 (ASTM B 75M) copper tube or ASTM B 584 bronze castings.
a) Copper-Tubing, Keyed Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.
2) Below-Grade:
a) Meet requirements of ASTM B88, Type K. 3/4 inch minimum under slabs.
b) 2 inches And Smaller: Annealed soft drawn.
c) 2-1/2 inches And Larger: Hard Drawn.
3) Fittings:
a) For Copper Pipe: Wrought copper.

3. Connections For Copper Pipe:
    a. Above-Grade:
        1) Sweat copper type with 95/5 or 96/4 Tin-Antimony solder, Bridgit solder, or Silvabrite 100 solder. Use only lead-free solder.
        2) Viega ProPress System
    b. Below Grade:
        1) Brazed using following type rods:
            a) Copper to Copper Connections:
                (1) AWS Classification BCuP-4 Copper Phosphorus (6 percent silver).
                (2) AWS Classification BCuP-5 Copper Phosphorus (15 percent silver).
        2) Copper to Brass or Copper to Steel Connections: AWS Classification BAg-5 Silver (45 percent silver).
        3) Do not use rods containing Cadmium.
        4) Brazing Flux:
            a) Approved Products:
                (1) Stay-Silv white brazing flux by Harris Product Group.
                (2) High quality silver solder flux by Handy & Harmon.
        5) Joints under slabs acceptable only if allowed by local codes.
4. Ball Valves:
    a. Use ball valves exclusively unless otherwise specified. Ball valves shall be by single manufacturer from approved list below.
    b. Valves shall be two-piece, full port for 150 psi SWP.
        1) Operate with flow in either direction, suitable for throttling and tight shut-off.
        2) Body: Bronze, 150 psig wsp at 350 deg F and 400 psig wog.
        3) Seat: Bubble tight at 100 psig under water.
    c. Class One Quality Standard: Nibco T585 or S585.
        1) Equal by Conbraco 'Apollo,' Hammond, Milwaukee, or Watts.
5. Combination Pressure Reducing Valve / Strainer:
    a. Integral stainless steel strainer, or separate 'Y' strainer installed upstream of pressure reducing valve.
    b. Built-in thermal expansion bypass check valve.
    c. Class One Quality Standard: Watts LFU5B:
        1) Equal by Cash Acme, Cla-Val Hi Capacity, Conbraco 36C, Honeywell-Braukmann, Spence Hi Capacity, Watts, or Wilkins. See Section 01 6200.
    d. .

PART 3 - EXECUTION

3.1 INSTALLATION

A. Below Grade:
    1. Install piping under slabs without joints where possible.
    2. Insulate water piping buried within building perimeter.
    3. Bury water piping 6 inches minimum below bottom of slab and encase in 2 inches minimum of sand.

B. Locate cold water lines a minimum of 6 inches from hot water line.

3.2 FIELD QUALITY CONTROL

A. Field Tests:
    1. Before pipes are covered, test systems in presence of Architect/Engineer at 125 psig hydrostatic pressure for four (4) hours and show no leaks.
    2. Disconnect equipment not suitable for 125 psig pressure from piping system during test period.

3.3 ADJUSTING

A. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

1. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.

2. Adjust calibrated balancing valves to flows indicated.

3.4 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.

2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

D. Water system will not be accepted until negative bacteriological test is made on water taken from system. Repeat dosing as necessary until such negative test is accomplished.

END OF SECTION

SECTION 22 11 19 DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Balancing valves.
2. Washer-supply outlets.
3. Key-operation hydrants.
4. Trap seal primer valves.
5. Drain valves.
6. Miscellaneous piping specialties.
7. Sleeve penetration systems.
8. Flashing materials.

1.2 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
1. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.

PART 2 - PRODUCTS

2.1 BALANCING VALVES

A. Calibrated Balancing Valves: Adjustable, with two readout ports and memory setting indicator. Include manufacturer's standard hoses, fittings, valves, differential pressure meter, and carrying case.
1. Manufacturers:

1. Armstrong Pumps, Inc.
2. Flow Design, Inc.
3. ITT Industries; Bell & Gossett Div.
4. Taco, Inc.
5. Watts Industries, Inc.; Water Products Div.

2. 2” and Smaller: Bronze body with brass ball, adjustment knob, calibrated nameplate, and threaded or solder-joint ends.
3. 2” and Smaller: Bronze, Y-pattern body with adjustment knob and threaded ends.
4. 2.5” and Larger: Cast-iron, Y-pattern body with bronze disc and flanged or grooved ends.

B. Memory-Stop Balancing Valves, NPS 2 (DN 50) and smaller: MSS SP-110, ball valve, rated for 400-psig (2760-kPa) mininmum CWP. Include two-piece, copper-alloy body with full-port, chrome-plated brass ball, replaceable seats and seals, threaded or solder-joint ends, and vinyl-covered steel handle with memory-stop device.

1. Manufacturers:

1. Conbraco Industries, Inc.
2. Crane Co., Crane Valve Group; Crane Valves.
3. Grinnell Corporation.
4. NIBCO INC.
5. Red-White Valve Corp.

2.2 STRAINERS

A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64-inch (1.2-mm) round perforations, unless otherwise indicated.

1. Pressure Rating: 125-psig (860-kPa) minimum steam working pressure, unless otherwise indicated.
2. NPS 2 (DN 50) and Smaller: Bronze body, with female threaded ends.
3. NPS 2-1/2 (DN 65) and Larger: Cast-iron body, with interior AWWA C550 or FDA-approved, epoxy coating and flanged ends.

2.3 OUTLET BOXES

A. Manufacturers:

1. Acorn Engineering Company.
2. Gray, Guy Manufacturing Co., Inc.
3. Symmons Industries, Inc.

B. General: Recessed-mounting outlet boxes with supply fittings complying with ASME A112.18.1M. Include box with faceplate, services indicated for equipment connections, and wood-blocking reinforcement.

C. Clothes Washer Outlet Boxes: With hot- and cold-water hose connections, drain, and the following:

1. Box and Faceplate: [Stainless steel] [Enameled or epoxy-painted steel].
2. Shutoff Fitting: Two hose bibbs.
3. Supply Fittings: Two NPS 1/2 (DN 15) gate, globe, or ball valves and NPS 1/2 (DN 15) copper, water tubing.
4. Drain: NPS 2 (DN 50) standpipe, P-trap, and direct waste connection to drainage piping.
5. Inlet Hoses: Two ASTM D 3571, 60-inch- (1500-mm-) long, rubber household clothes washer inlet hoses with female hose-thread couplings.
6. Drain Hose: One 48-inch- (1200-mm-) long, rubber household clothes washer drain hose with hooked end.

D. Icemaker Outlet Boxes: With hose connection and the following:

1. Box and Faceplate: Stainless steel.
2. Shutoff Fitting: Hose bibb.
3. Supply Fitting: NPS 1/2 (DN 15) gate, globe, or ball valve and NPS 1/2 (DN 15) copper, water tubing.

2.4 KEY-OPERATION HYDRANTS

A. Manufacturers:

1. Josam Co.

2. Smith, Jay R. Mfg. Co.
3. Woodford Manufacturing Co.

B. General: ASME A112.21.3M, key-operation hydrant with pressure rating of 125 psig.

1. Inlet: 3/4 " or NPS 1" threaded or solder joint.
2. Outlet: ASME B1.20.7, garden-hose threads.
3. Operating Keys: One with each key-operation hydrant.

C. Moderate-Climate, Concealed-Outlet Wall Hydrants: ASSE 1019, self-drainable with flush-mounting box with cover, integral nonremovable hose-connection vacuum breaker, and concealed outlet.

1. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.

D. Hot and Cold, Nonfreeze Concealed-Outlet Wall Hydrants: With deep flush-mounting box with cover; hot- and cold-water casings and operating rods to match wall thickness; concealed outlet; wall clamps; and factory- or field-installed, nonremovable and manual drain-type, hose-connection vacuum breaker complying with ASSE 1011.

2.5 ROOF HYDRANTS

1. Design Criteria:
   1) Provide dual check backflow preventer.
   2) Non-freeze.
   3) Drain port - connect to drain

2.6 TRAP SEAL PRIMER VALVES

A. Supply-Type Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:
1. Manufacturers:

   1. Josam Co.
   2. MIFAB Manufacturing, Inc.
   3. Precision Plumbing Products, Inc.
   4. Smith, Jay R. Mfg. Co.

2. 125-psig (860-kPa) minimum working pressure.
3. Bronze body with atmospheric-vented drain chamber.
4. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
5. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.7 MISCELLANEOUS PIPING SPECIALTIES

A. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, metal-bellows type with pressurized metal cushioning chamber. Sizes indicated are based on ASSE 1010 or PDI-WH 201, Sizes A through F.
1. Manufacturers:

   1. Josam Co.
   2. Smith, Jay R. Mfg. Co.
   3. Tyler Pipe; Wade Div.
   4. Zurn Industries, Inc.; Specification Drainage Operation.

B. Hose Bibbs: Bronze body with replaceable seat disc complying with ASME A112.18.1M for compression-type faucets. Include NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet, of design suitable for pressure of at least 125 psig (860 kPa); integral [or field-installed,] nonremovable, drainable hose-connection vacuum breaker; and garden-hose threads complying with ASME B1.20.7 on outlet.

C. Roof Flashing Assemblies: Manufactured assembly made of [4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch-(1.6-mm-)] [6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch- (2.4-mm-)] thick, lead flashing collar and skirt extending at least [6 inches (150 mm)] [8 inches (200 mm)] [10 inches (250 mm)] from pipe with galvanized steel boot reinforcement, and counterflashing fitting.

D. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.

E. Fixed Air-Gap Fittings: Manufactured cast-iron or bronze drainage fitting with semiopen top with threads or device to secure drainage inlet piping in top and bottom spigot or threaded outlet larger than top inlet. Include design complying with ASME A112.1.2 that will provide fixed air gap between installed inlet and outlet piping.

F. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.

G. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.

H. Vent Terminals: Commercially manufactured, shop- or field-fabricated, frost-proof assembly constructed of galvanized steel, copper, or lead-coated copper. Size to provide 1-inch (25-mm) enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

I. Expansion Joints: ASME A112.21.2M, assembly with cast-iron body with bronze sleeve, packing gland, and packing; of size and end types corresponding to connected piping.

2.8 SLEEVE PENETRATION SYSTEMS

A. Manufacturers:

1. ProSet Systems, Inc.

B. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.

1. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
2. Stack Fitting: ASTM A 48 (ASTM A 48M), gray-iron, hubless-pattern, wye-branch stack fitting with neoprene O-ring at base and gray-iron plug in thermal-release harness in branch. Include PVC protective cap for plug.

    1. Special Coating: Include corrosion-resistant interior coating on fittings for plastic chemical waste and vent stacks.

2.9 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.

2. Vent Pipe Flashing: 3-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

B. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.

C. Fasteners: Metal compatible with material and substrate being fastened.

D. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

E. Solder: ASTM B 32, lead-free alloy.

F. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.
1) Not required to meet NSF International Standards for Lead Free.
2. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
1) Jay R. Smith: 5907.
2) Prier: P-RH2.
3) Woodford: RHY2-MS.
2. Water Hammer Arrestors:
1. Design Criteria:
1) Meet NSF International Standards for Lead Free.
2) Nesting type, air pre-charged bellows with casing.
3) Bellows constructed of stabilized 18-8 stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install pressure regulators with inlet and outlet shutoff valves and balance valve bypass. Install pressure gages on inlet and outlet.

B. Install strainers on supply side of each control valve, pressure regulator, and solenoid valve.

C. Install trap seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

D. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

E. Install expansion joints on vertical risers, stacks, and conductors if indicated.

3.2 CONNECTIONS

A. Install piping adjacent to equipment to allow service and maintenance.

B. Ground equipment.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

D. Connect plumbing specialties and devices that require power.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled trap seal primer systems and their installation, including piping and electrical connections. Report results in writing.

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:

1. Furnish and install soil, waste, and vent piping systems within building and connect with outside utility lines 5 feet out from building where applicable.
2. Perform excavation and backfill required by work of this Section.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Cover Observation.

1. Contact Architect/Engineer prior to covering any section of pipe.
2. All piping all be under pressure during observation

1.3 REFERENCES

A. Reference Standards:

1. International Code Council:
   a. ICC IPC-2012, 'International Plumbing Code'.

1.4 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Shop Drawings: For solvent drainage system, include plans, elevations, sections, and details.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CAST IRON PIPING

A. Gray Cast Iron Pipe: ASTM , solid-wall drain, waste, and vent.

B. Plenum Vent Lines: In areas of building with a return air plenum.

a. Approved Types:
   1) Service weight, single-hub or no-hub type cast iron soil pipe meeting requirements of ASTM A74.
   2) Vent lines 2-1/2 inches or smaller may be Schedule 40 galvanized steel.

b. Joint Material:
   1) Single-Hub: Rubber gaskets meeting requirements of ASTM C564.
   2) No-Hub Pipe: Neoprene gaskets with stainless steel cinch bands.

c. Fittings:

d. Cast Iron Pipe: Hub and spigot, except fittings for no-hub pipe shall be no-hub, and meet requirements of ASTM A74.
   1) Joint Material: Rubber gaskets meeting requirements of ASTM C564.
   2) Galvanized Pipe: Screwed Durham tarred drainage type.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

B. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.

C. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep ¼ bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8- bend fittings if 2 fixture are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

D. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

E. Re-verify building drainage piping slope before covering pipe in trench if left uncovered over a 24 hour period of subjected to exterior water. If slope of piping has changed, provide new shoring material to maintain original slope after trench has been covered.

F. Install soil and waste drainage and vent piping at the code required minimum slopes, unless otherwise indicated:

G. Install engineered soil and waste drainage and vent piping systems in locations indicated and as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
2. Cast-Iron, Sovent, Single Stack: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.
3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

H. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

I. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

J. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

K. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Section "Plumbing Fixtures."
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.

3.3 Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger

3.4 FIELD QUALITY CONTROL

A. Field Tests:

1. Conduct tests for leaks and defective work. Notify Architect before testing.

B. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

C. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

D. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

E. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.5 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install electric water heater as specified in Contract Documents.

1.2 REFERENCES

A. Reference Standard:
   1. NSF International Standard / American National Standards Institute:
      a. NSF/ANSI 61-2012, 'Drinking Water System Components - Health Effects'.
      b. NSF/ANSI 372-2011, 'Drinking Water System Components - Lead Content'.

1.3 SUBMITTALS

A. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Operations and Maintenance Data:
         1) Maintenance and operational instructions.
      b. Warranty Documentation:
         1) Final, executed copy of Warranty.
      c. Record Documentation:
         1) Manufacturers documentation:
            a) Manufacturer's literature or cut sheet.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.
   2. California only: California Assembly Bill 1953 (AB1953) Compliant for Lead Free.

1.5 WARRANTY

A. Special Warranty:
   1. Three-year non-prorated warranty on water heaters of 20 gallon capacity and larger.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

A. Manufacturers:
   1. Manufacturer Contact List:
      a. A O Smith Water Products Co,
      b. Bradford-White Corp, Ambler,.

c. Rheem / Ruud Water Heater Div
d. Ruud Manufacturing Co.,
e. State Industries Inc,

B. Materials:
1. Design Criteria:
a. All (wetted) drinking water products, components, and materials used in drinking water systems must meet NSF International Standards for Lead Free.
b. All water heaters require 'Tempered Water Temperature Control' (mixing valves) as specified in Section 22 1116.
2. 30 Gallon to 50 Gallon Regular Height:
a. Glass lined storage tank pressure tested and rated for 125 psi (862 kPa) working pressure.
b. Water heaters shall each have ASME rated temperature-pressure relief valve rated at MBH input of heater minimum set to relieve at 120 psi (827 kPa).
c. 9 Kw.
d. 3 inches (75 mm) minimum glass fiber or polyurethane foam insulation.
e. Complete with two stage thermostat, magnesium anode, electric sheath rod type heating element, and high limit control.
f. Heater shall be pre-wired and entire unit bear UL label.
g. Manufactures
1) American:
2) A O Smith:
3) Bradford White:
4) Rheem
5) State Industries: SB6-40.

2.2 ACCESSORIES

A. Anchoring Components:
1. One inch (25 mm) by 18 ga (1.2 mm) galvanized steel straps.
2. No. 10 by 2-1/2 inch (64 mm) screws.

B. Thermal Expansion Absorbers:
1. Bladder type for use with potable water systems.
2. Type One Acceptable Products.
a. Therm-X-Trol ST-12-C by Amtrol Inc, West Warwick, RI www.amtrol.com.
b. Equal as approved by Architect before bidding.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install temperature-pressure relief valve on hot water heater and pipe discharge to directly above funnel of floor drain.

3.2 ADJUSTING

A. Set discharge water temperature at 140 deg F (60 deg C). Final hot water temperature shall be 110 deg F (43 deg C) after missing valve. If no mixing valve set discharge temperature at 110 deg F (43 deg C).

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes plumbing fixtures and related components.

1.3 DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.4 SUBMITTALS

A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.

C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E. TAS: Texas Accessibility Standards.

1.6 COORDINATION

A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. For fixture descriptions in other Part 2 articles where the subparagraph titles "Products," and "Manufacturers" introduce a list of manufacturers and their products or manufacturers only, the following requirements apply for product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified in other Part 2 articles.

2.2 LAVATORY FAUCETS

A. Lavatory Faucet: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
1. Products:

a. American Standard.
b. Eljer.
c. Kohler.

2.3 SINK FAUCETS

A. Sink Faucet: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
1. Manufacturers:

a. American Standard.
b. Eljer
c. Kohler

2.4 TOILET SEATS

A. Toilet Seat: Solid plastic.
1. Manufacturers:

a. Bemis.
b. Beneke.
c. Centoco.
d. Church.

2.5 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Guard, Manufactured, plastic enclosure for covering for hot- and cold-water supplies and trap and drain piping and complying with ADA requirements.
   1. Manufacturers:

      a. Engineered Brass Co.
      b. Plumerex
      c. Truebro.

2.6 FIXTURE SUPPORTS

A. Water-Closet Support: Water-closet combination carrier designed for accessible and standard mounting heights. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.
   1. Manufacturers:
      a. Mifab
      b. Josam.
      c. Wade.
      d. Zurn

B. Urinal Support: Not required

C. Lavatory Support: Not required

D. Sink Support: Type II, sink carrier with hanger plate, bearing studs, and tie rod. Include steel uprights with feet.
   1. Manufacturers:

      a. Josam.
      b. J.R. Smith
      c. Zurn.

2.7 WATER CLOSETS

A. Water Closets: Accessible, wall-hanging, back-outlet, vitreous-china fixture designed for flushometer valve operation.
   1. Products:

      a. American Standard, Inc.
      b. Kohler Co.
      c. TOTO USA, Inc.

B. Water Closets: Institutional Combination Lavatory/Toilet
   1. Products:

      a. ACORN

b. All others shall be submitted for pre-approval prior to bid date.

2.8 LAVATORIES, SINKS

A. Lavatories,: Accessible, counter top, vitreous-china fixture.
1. Products:

a. American Standard, Inc.
b. Kohler Co.
c. Toto
d. CRANE

2.9 SINKS

A. Sinks: Commercial, counter-mounting, stainless-steel fixture.
1. Products:

a. Elkay Manufacturing Co.
b. Just Manufacturing Co.

2.10 SERVICE SINKS

A. Service/Mop Sinks: Floor-mounting, enameled, sink with front apron, raised back, and coated, wire rim guard.
1. Products:

a. Commercial Enameling Co.
b. Kohler Co.
c. Fiat

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FIXTURE INSTALLATION

A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-hanging fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valve if stops are not specified with fixture. Refer to Division 15 Section "Valves" for general-duty valves.

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install toilet seats on water closets.

N. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

O. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

P. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

Q. Install traps on fixture outlets.

R. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.

S. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water supplies from water distribution piping to fixtures.

C. Connect drain piping from fixtures to drainage piping.

D. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.

E. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.

F. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.

B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets, shower valves, and flushometer valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Drinking fountains.
2. Self-contained water coolers.
3. Fixture supports.

1.3 DEFINITIONS

A. Accessible Drinking Fountain and Water Cooler: Fixture that can be approached and used by people with disabilities.

B. Drinking Fountain: Fixture with nozzle for delivering stream of water for drinking.

C. Fitting: Device that controls flow of water into or out of fixture.

D. Fixture: Drinking fountain or water cooler, unless one is specifically indicated.

E. Water Cooler: Electrically powered fixture for generating and delivering cooled drinking water.

1.4 SUBMITTALS

A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each type of fixture indicated.

B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For fixtures to include in maintenance manuals specified in Division.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" about fixtures for people with disabilities.

C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

D. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.

E. TAS: Texas Accessibility Standards.

1.6 COORDINATION

A. Coordinate roughing-in and final fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified below.

1. Elkay.
2. Halsey Taylor.
3. Haws Corporation.

2.2 DRINKING FOUNTAINS

A. Drinking Fountains,: Accessible, Style W, wall-hanging fixture made of stainless steel.

1. Receptor Shape: Rectangular.
2. Back Panel: Stainless-steel wall plate behind drinking fountain.
3. Bubblers: Two, with automatic stream regulator, located on deck.
4. Control: Push button.
5. Supply: NPS 3/8 (DN 10) with ball, gate, or globe valve.
6. Drain: Grid with NPS 1-1/4 (DN 32) minimum horizontal waste and trap complying with ASME Standards.
7. Support: Type I, water-cooler carrier. Refer to "Fixture Supports" Article.

2.3 SELF-CONTAINED WATER COOLERS

A. Water Coolers: Accessible, ARI 1010, Type PB, pressure with bubbler, Style W, wall-hanging fixture.

1. Cabinet: Bilevel with two attached cabinets, enameled steel with stainless-steel top.
2. Bubbler: One, with automatic stream regulator, located on each cabinet deck.
3. Control: Push button.
4. Supply: NPS 3/8 (DN 10) with ball, gate, or globe valve and filter.

5. Drain: Grid with NPS 1-1/4 (DN 32) minimum horizontal waste and trap complying with ASME Standards.
6. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.

    a. Capacity: 8 gph (0.0084 L/s) of 50 deg F (10 deg C) cooled water from 80 deg F (27 deg C) inlet water and 90 deg F (32 deg C) ambient air temperature.
    b. Electrical Characteristics: 1/5 hp; 120-V ac; single phase; 60 Hz.

7. Support: Type II, water-cooler carrier. Refer to "Fixture Supports" Article.

2.4 FIXTURE SUPPORTS

A. Off-Floor, Plumbing Fixture Supports: ASME A112.6.1M, water-cooler carriers. Include vertical, steel uprights with feet and tie rods and bearing plates with mounting studs matching fixture to be supported.

1. Available Manufacturers:
2. Manufacturers:

    a. Josam Co.
    b. Smith, Jay R. Mfg. Co.
    c. Tyler Pipe; Wade Div.
    d. Zurn Specifications Drainage Operation.

3. Type I: Hanger-type carrier with two vertical uprights.
4. Type II: Bilevel, hanger-type carrier with three vertical uprights.
5. Supports for Accessible Fixtures: Include rectangular, vertical, steel uprights instead of steel pipe uprights.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before fixture installation. Verify that sizes and locations of piping and types of supports match those indicated.

B. Examine walls and floors for suitable conditions where fixtures are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Use carrier off-floor supports for wall-hanging fixtures, unless otherwise indicated.

B. Use chrome-plated brass or copper tube, fittings, and valves in locations exposed to view. Plain copper tube, fittings, and valves may be used in concealed locations.

3.3 INSTALLATION

A. Install off-floor supports affixed to building substrate and attach wall-hanging fixtures, unless otherwise indicated.

B. Install mounting frames affixed to building construction and attach recessed water coolers to mounting frames, unless otherwise indicated.

C. Install fixtures level and plumb.

D. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Refer to Division Section "Valves" for general-duty valves.

E. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

F. Install pipe escutcheons at wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings. Refer to Division Section "Basic Mechanical Materials and Methods" for escutcheons.

G. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division for sealant and installation requirements.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water supplies from water distribution piping to fixtures.

C. Connect drain piping from fixtures to drainage piping.

D. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The following Summary of Work is intended as an aid to achieve an understanding of the various elements of work included in the project, as is not intended to be all-inclusive. Detailed descriptions of work and requirements are given in drawings and specifications.

B. Mechanical Contract Documents were prepared for the Project by:

Trinity MEP Engineering, LLC
3533 Moreland Dr. Ste. A
Weslaco, Texas 78596
Phone Number: (956) 973-0500
Contact Person: Leonardo Munoz, P.E.

C. General Scope of Work:

1. Install AC equipment and ductwork as shown on the contract documents. Refer to drawings for schedule of equipment that will be installed. After installing equipment, connect power to unit.

2. HVAC: Provide all materials and labor associated with a complete operational installation of new HVAC systems including, but not limited to:

- Chilled Water Central Station Air Handlers
- VAV Boxes
- Exhaust fans
- Sheet metal, Ductwork
- Diffusers and Grilles
- Duct accessories, including grilles, and louvers
- Air Test and Balance
- Building Automation System

1.3 COORDINATION

A. All mechanical work shall be done under sub-contract to a General Contractor. Mechanical Contractor shall coordinate all work through General Contractor, even in areas where only mechanical work is to take place.

B. Coordination between all trades shall take place on a regular basis to avoid conflicts between disciplines and equipment clearances.

C. Work shall take place with minimal disruption to Owner's operations in areas surrounding the new building.

D. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

E. Fully coordinate with electrical contractor for providing power to mechanical equipment.

F. Mechanical Contractor is responsible for all control wiring including thermostat(s). This includes all conduit, wire, and accessories both low voltage and source voltage for the controls' system. Mechanical Contractor will provide all the necessary actuators, relays, software, hardware, and all necessary accessories required for a fully functional controls' system.

1.4 UTILITIES

1. Coordinate with power, water, telephone, cable and gas utilities to locate all utilities prior to digging in any area.
2. Obtain any approvals required from utilities to relocate utilities.
3. Cost of relocating or bypassing utilities indicated on drawings shall be included in Base Bid.

1.5 CONTRACTOR USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
   1. Owner Occupancy: Allow for Owner occupancy and use by the public.
   2. Driveways and Entrances: Keep driveways and entrances serving the premises, clear and available to the Owner, the Owner's employees, and emergency vehicles at all time. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Site Safety: Take every precaution to ensure the site does not present a threat to the safety of occupants and/or workers. Minimal safety requirements include, but are not limited to the following:

   1. Temporary fencing around construction areas.
   2. Yellow caution tape and construction barricades along open trenches during the day. Trenches shall be covered at night and warning lights provided on construction barricades.
   3. Temporary fencing around equipment while site work is in progress.

1.6 SUBMITTALS

1. To extradite the submittal process more efficiently, DO NOT piece-meal the submittals. Submit entire mechanical or plumbing in a bound enclosure. This will eliminate delays in the submittal process.

END OF SECTION

SECTION 23 05 10 Basic Mechanical Materials and Methods

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General y Conditions and Division Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes piping materials, general- and special-duty valves, fittings, expansion joints and compensation devices, specialties and installation requirements for hot-water heating, chilled-water cooling, refrigerant systems and condensate drain piping.

B. Related Sections include the following -

1. Basic Mechanical Requirements.
2. Vibration Isolation and Seismic Restraints.
3. Insulation (Mechanical).
4. Heating Equipment.
5. Water Treatment (HVAC Systems).
6. HVAC Equipment - Air Side.
7. Temperature Controls.

DEFINITIONS

A. Hydronic Systems: Hot-water heating and chilled-water cooling systems.

B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

C. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

D. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

E. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

F. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated attics.

G. The following are industry abbreviations for plastic materials -

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PTFE: Polytetrafluoroethylene plastic.

5. PVC: Polyvinyl chloride plastic.
6. TFE: Tetrafluoroethylene plastic.

H. The following are industry abbreviations for rubber materials -

1. BR: Butyl rubber.
2. Buna-N: Nitrile rubber.
3. CR: Chlorosulfonated polyethylene synthetic rubber.
4. CSM: Chlorosulfonyl-polyethylene rubber.
5. EPDM: Ethylene-propylene-diene terpolymer rubber.
6. HDPE: High density polyethelene rubber.
7. NBR: Acrylonitrile-butadiene rubber.
8. NR: Natural rubber.

9. PTFE: Polytetrafluoroethylene plastic.

I. The following are standard abbreviations for valves - 1. CWP: Cold working pressure.

1.4 PERFORMANCE REQUIREMENTS

A. Products shall be compatible with and suitable for piping system fluids, materials, working pressures, and temperatures.

B. Pipe expansion fittings, loops and products shall absorb 200 percent of maximum axial movement between anchors.

1.5 SUBMITTALS

A. Submit Product Data for -

1. Transition and dielectric fittings.
2. General duty valves including body, seating and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; required clearances; rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
3. Expansion joints and alignment guides.
4. Hydronic special-duty valves including flow and pressure drop curves based on manufacturer's test data for diverting fittings, calibrated balancing valves, and automatic flow-control valves.

B. Submit Shop Drawings for -

1. For pipe expansion fittings and loops, signed and sealed by a professional engineer-
a. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and bends.
b. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
c. Alignment Guide Details: Detail field assembly and attachment to building structure.
d. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections and location for each expansion joint.
2. For hydronic piping systems -
a. Detail fabrication of pipe anchors, hangers, special pipe support assemblies, alignment guides, expansion joints and loops, and their attachment to the building

structure. Detail location of anchors, alignment guides and expansion joints and loops.

C. Submit Welding Certificates -

1. Provide copies of certificates for welding procedures and personnel.

D. Submit Product Certificates -

1. Provide copies of product certificates for each type of expansion joint, signed by the product manufacturer.

E. Submit Field Test Reports -

1. Provide written reports of tests specified in Part 3 of this Section including the procedures used, the results that complied with requirements, the results that failed to meet the requirements and the corrective actions taken to achieve the requirements.

F. Submit Operation and Maintenance Data -

1.6 QUALITY ASSURANCE

A. Welding -

B. ASME Compliance -

1. ASME B31.1, "Power Piping" and ASME B31.9, "Building Services Piping" for materials, products and installation, as appropriate for the piping system application.
2. Safety valves and pressure vessels shall bear the appropriate ASME label.
3. Fabricate and stamp air separators and expansion/compression tanks to comply with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. UL 429, "Electrically Operated Valves."

1.7 DELIVERY, STORAGE AND HANDLING

A. Shipped valves shall have internal parts protected against rust and corrosion and shall have threads, flange faces, grooves and weld ends protected from damage. Angle, gate and globe valves shall be shipped in closed position. Ball and plug valves shall be shipped open to minimize exposure of functional surfaces. Butterfly valves shall be shipped closed or slightly open.

B. Maintain pipe and valve end protection during storage.

C. Use slings to handle large valves, rigged to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points.

D. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.08 COORDINATION

Coordinate layout and installation of piping and suspension system components with other construction, including light fixtures, HVAC equipment, fire-suppression-system components and partition assemblies.

Coordinate pipe sleeve installations for foundation wall penetrations.

Coordinate piping installation with roof curbs, equipment supports, and roof penetrations. Roof specialties are specified in Division 7 Sections.

Coordinate pipe fitting pressure classes with products specified in related Sections.

Coordinate size and location of concrete bases. Cast anchor-bolt inserts into base. Concrete, reinforcement and formwork requirements are specified in Division 3 Sections.

Coordinate installation of pipe sleeves for penetrations through exterior walls and floor assemblies. Coordinate with requirements for fire stopping specified in Sectionand Division 7 for through-penetration firestop systems for fire and smoke wall and floor assemblies.

1.09 WARRANTY

A. Refer to Division 1 for specific requirements. In general, manufacturers of all equipment and/or products provided for this project shall provide a one (1) year warranty on all parts and labor.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURER

A. In other Part 2 articles where "acceptable manufacturers" are listed, a material manufactured by any of the following listed manufacturers shall "approved") only if the specific product or material can evidence exact Contract Documents

PIPING MATERIALS A. Chilled Cooling and Hot-Water Heating Piping -

1. Aboveground -

a. For 2-inch nominal pipe size (n.p.s.) and smaller, use black steel pipe, ASTM A-53, Typs S (seamless) or Type F (furnace-butt welded), Grade A or B, Schedule 40 with plain ends and threaded joints or ASTM B-88, Type L drawn-temper (hard) copper tubing with soldered joints. Solder filler metal shall comply with ASTM B-22, 95-5 tin antimony, include water-washable flux according to ASTM B-813.

b. For 2^-inch n.p.s. to 12-inch n.p.s., use black steel pipe, ASTM A-53, Type E (electric-resistance welded), Grade B, Schedule 40 with plain ends and welded and flanged joints.

c. For 14-inch n.p.s. and larger, use black steel pipe, ASTM A-53, Type E (electric- resistance welded) or Type S (seamless), Grade B, Schedule 30 with plain ends and welded and flanged joints.

2. Belowground -

b. For all sizes of Chilled Water and Heating Water Piping use a pressure testable preinsulated HDPE-jacketed ductile iron restrained joint pipe with EPDM gaskets.

1) Carrier pipe shall be ductile iron, 150 psi minimum rating, in nominal lengths standard to the industry for the specified product. Pipe and fittings shall contain an internal cement lining and be coated externally with a bitumastic seal coat. Maximum operating temperature with EPDM gaskets is 220°F.

2) Install piping in accordance with the specifications and manufacturer's published installation instructions.

3) Insulation shall be polyurethane foam either spray applied or high pressure injected with one shot into the annular space between carrier pipe and jacket. Insulation shall be rigid, 90-95% closed cell polyurethane with a 2.0 to 3.0 pound per cubic foot density and coefficient of thermal conductivity (K-Factor) of 0.14 to 0.16 and shall conform to ASTM C-591. Maximum operating temperature shall not exceed 200°F. Insulation thickness shall be 1^-inches minimum for Chilled Cooling and 2-inches minimum for Heating Water.

4) Jacketing material shall be extruded, black, high density polyethylene (HDPE), manufactured to be compatible with ASTM D-3350 having a minimum wall thickness of 125 mils for jacket sizes less than 12-inch and 150 mils for jacket sizes 12-inch to 24-inch. The jacket shall meet the specifications shown below. The jacket shall incorporate electric fusion, butt fusion, or extrusion welding at all fittings. Anchor water shed rings shall be sealed with a Raychem Dirax or Canusa GTS-65 wrap prohibiting the ingression of water.

a) Special Gravity (ASTM D792:
0.941 minimum.

b) Tensile Strength (ASTM D638):
3100 psi minimum.

c) Elongation Ultimate (ASTM D638):
400% minimum.

d) Compressive Strength (ASTM D695):
2700 psi minimum.

e) Impact Strength (ASTM D256):
2.0 Ft. Lb/in. North minimum.

f) Rockwell Hardness (ASTM D785):
D60 (Shore) minimum.

5) Moisture barrier end seals shall be factory applied, sealed to the jacket and carrier pipe. End seals shall be heat shrink type only, completely sealing the exposed end of the insulation. Field applied end seals shall be installed at any field cut to the piping before continuing with the installation.

6) Straight run joints shall be insulated using polyurethane foam to the thickness specified, and sealed according to the manufacturer's written instructions. All joint closures and insulation shall occur at straight sections of pipe.

7) Joints and fittings to be restrained joint type and conform to ANSI/AWWA C115/A21.15. Joint gaskets shall be EDPM suitable for temperatures up to 220°F. All ductile iron joints and fittings shall be insulated with field kits to permit maximum joint flexibility. Fittings and joints shall be manufactured by United States Pipe Foundry or Clow. Restraint of field cut pipe shall be provided with U.S. TR Flex or Clow "Super-Lock".

8) System shall be similar or equal to Ferro-Therm D.I. as manufactured by Thermocor Process, L.P., of Ft. Worth, Texas or XTRUtherm as manufactured by Perma-Pipe, Inc. of Niles, Illinois; Insul Pipe Systems.

B. Cooling Coil Condensate Drain Piping -

1. For all sizes, use ASTM B-88, Type L drawn-temper (hard) copper tubing with soldered joints.

C. Refrigerant Piping -

1. For all sizes, use ASTM B-280, Type ACR drawn-temper (hard) copper tubing with brazed joints.

2.3 THREADED FITTINGS FOR HYDRONIC PIPE

A. Pipe fittings for threaded steel pipe, where neither the static nor the operating heads exceed 285 feet (125 psi), shall conform to the following ASME Standards -

1. Cast-Iron (threaded): ASME B16.4, Class 125.

2. Malleable-Iron (threaded): ASME B16.3, Class 150.

B. Factory-threaded pipe and fittings shall comply with ASME B1.20.1.

2.4 UNIONS AND FLANGE FITTINGS

A. Unions 2-inch n.p.s. and Smaller: Comply with ASME B16.22 (wrought-copper) or ASME B16.39 (malleable-iron), as required to match adjacent piping.

B. Flanges Larger than 2^-inch n.p.s.: Wrought-cast or forged-steel, ASME B16.5, including bolts, nuts and gaskets suitable for application and system pressure requirements, butt-welded end connection and raised face.

C. Flange Bolts and Nuts: Comply with ASME B18.2.1, material as required by system pressures. 1. Underground flange bolts shall be core tin.

D. Flange Gasket Materials: Comply with ASME B16.21, suitable for chemical and thermal conditions of piping system contents, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, Class 125 or Class 250 as required by system pressures. If compatible with application, rubber, flat face gaskets complying with AWWA C110 are acceptable.

2.5 WELDED FITTINGS

A. In lieu of threaded or flanged fittings, Contractor may, except at unions, fusion weld ferrous piping using welding material complying with AWS D10.12 that is appropriate for wall thickness and chemical analysis of pipe. Piping 2-inch size and larger shall be butt welded, and piping 1^-inch size and smaller shall be connected with socket welding or threaded fittings.

B. Factory made welding fittings shall be used for elbows and reducing fittings; mitered joint elbows and field made reducers shall not be used. Branch connections may be made with tees or factory made forged steel saddles or flared outlets. Welding branch outlets may be furnished with butt weld, socket weld, or threaded branch connections as required for the installation. Welding fittings shall be of the same wall thickness as the pipe in which they are installed.

C. Factory made welding nipples may be used for branch connections when the diameter of the branch connection does not exceed 50 percent of the diameter of the main, except that in water systems operating at less than 125 psi factory made shaped welding nipples may be used for branch connections up to one pipe size smaller than the main. Welding end valves shall be used in welded pipe lines. Factory made nipples or threaded welding outlets shall be used for branch connections; field cut pipe and standard threaded couplings shall not be used.

D. Flanges for welded piping systems shall be forged steel, welding neck type, of a pressure class not less than 150 percent of the system operating pressure. Welding fittings, outlets and flanges shall comply with the latest edition of the following standards and specifications -

1. Butt Welding Fittings: ASME B16.9
2. Socket Welding Fittings: ASME B16.11
3. Wrought Carbon Steel: ASTM A234/A234-01a.
4. Welded Flanges: ASME B16.5
5. Forged Steel, General Purpose, for Forged Steel Outlets and 150 and 300 psi Class Flanges: ASTM A181
6. Forged Steel, High Temperature, for Forged Steel Flanges, for Pressures Above 300 psi Class: ASTM A105

E. Factory made flared welding outlet fittings shall be a minimum of one pipe size smaller than the main to which it is connected, except that full size outlets may be used provided the fitting base is elliptical in shape and does not require cutting more than 35 percent of the circumference of the pipe.

F. All bolts shall have anti-seize applied.

2.6 SLEEVES AND PLATES

A. A. Provide in concrete, carpentry or masonry construction, hangers, sleeves, expansion bolts, inserts, supporting steel, or other fixtures necessary for the support of pipe, equipment and devices furnished under each Section of the Specifications. Sleeve locations shall be carefully coordinated and submitted on Shop Drawings for approval by the Architect, Engineer and/or Owner prior to installation.

B. Provide each pipe, conduit, or duct passing through fire, smoke or sound control walls, floors, ceilings or partitions with sleeves having internal dimension approximately 1 -inch larger than the outside dimension (including insulation) of pipes, conduits or ducts.

C. Sleeves (when required) through interior partitions shall be no less than 22 gage galvanized steel, set flush with the finished surfaces.

D. Sleeves through precast or post tensioned structures shall be no less than Schedule 40 galvanized steel pipe and shall be subject to the acceptance of the designer of the structure. Submit size, location, and sleeve material for approval.

E. Sleeves through grade slabs, basement or exterior wall shall be Schedule 40 steel, hot-dipped galvanized after fabrication, with water stop flange, set flush with finished surfaces, and a link- seal neoprene closure fitting installed between the pipe and the sleeves to provide a watertight seal.

F. Sleeves in wet or potentially wet floors, exterior walls or spaces such as mechanical equipment rooms or sprinklered areas, other than those requiring fire stopping, shall be Schedule 40 galvanized steel pipe with water stop flange and with the top of the sleeve projecting 2-inches above the finished floor or beyond the inside wall surface, and a link-seal neoprene closure fitting consisting of interlocking rubber links, bolts, nuts and metal pressure plates installed between the pipe and the sleeve to provide a watertight seal.

G. Pipes running through core drilled openings in existing concrete construction will require link seals neoprene closure fittings.

H. Attachments to structure shall be by means of MSS type beam clamps wherever practicable. Unavoidable attachments to concrete structure shall be by means of preset concrete inserts whenever the need for such attachment can be reasonably foreseen and the locations and sizes of inserts is known prior to pouring of concrete. In instances where it is necessary to make attachments to concrete and proper inserts have not been preset, the attachment shall be made by means of drilled holes, and expansion anchors of either the bolt stud or flush variety. Design working stress of attachments shall be limited to 25 percent of the average maximum (ultimate) stress values published by the

manufacturer

2.8 VALVES, GENERAL

A. Valves shall be of upstream pipe size, unless indicated otherwise, shall have temperature ratings compatible with conveyed fluid and shall have a working pressure of 125 psi or 150 percent of the system operating pressure, whichever is the greater.

B. Valve Actuators shall be -

1. Chain wheel for attachment to valves of 4-inch n.p.s. and larger size and higher than 96- inch mounting height.
2. Gear Drive for quarter-turn valves 8-inch n.p.s. and larger.
3. Handwheel for valves other than quarter-turn types.
4. Lever handle for quarter-turn valves 6-inch n.p.s. and smaller, except plug valves.
5. Wrench for plug valves with square heads. Furnish Owner with one (1) wrench for every 10 plug valves, for each size square plug head.

C. Provide extended valve stems on insulated valves.

D. Valve Flanges: Comply with ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.

E. Valve Threaded Joints: With threads according to ASME B1.20.1.

F. Valve Bypass and Drain Connections: Comply with MSS SP-45.

G. Valves in hydronic service shall be of the gate type, globe type, ball type, or butterfly type.

H. Valves in water system pump discharge connections shall be of the ball or butterfly type.

I. Globe Valves -

1. 2-inch n.p.s. and Smaller: MSS SP-80, Type 2, bronze, non-metallic disc, union-ring bonnet with solder-joint or threaded ends to match adjacent piping.
2. 2^-inch n.p.s. and Larger: MSS SP-85, Type I, cast-iron (gray-iron) body and bronze seats with threaded or flanged ends to match adjacent piping.

J. Check Valves -

1. In general, silent check valves shall -
a. incorporate a center guided, spring loaded disc, guided at opposite ends and having a short linear stroke that generates a flow area equal to the pipe size.
b. be capable of operating in horizontal or vertical positions with up or down flow. Provide heavy duty springs for vertical downflow installations on 14-inch n.p.s. and larger valves.
c. have component parts field replaceable without need of special tools.
d. have valve disc concave to the flow direction with flow contoured and unrestricted to provide full flow areas at all locations within the valve. Pressure loss through valve, measured in feet of water, shall not exceed six-tenths of the water velocity in feet per second.
e. have materials compatible with particular service and compatible to prevent electrolytic action.
f. provide bubble-tight shut-off.
2. Hydronic 2-inch n.p.s. and Smaller: Spring loaded, lift-disc; FCI 74-1, Type IV; bronze shell, bronze disc, bronze seats; with Buna-N or teflon seal for zero leakage; solder-joint or threaded ends to match adjacent piping.
3. Hydronic 2^-inch n.p.s. and Larger: Spring loaded, lift-disc; FCI 74-1, Type III Globe style or Apco 9000; cast-iron (grey-iron) body; bronze, aluminum alloy or stainless steel disc and seats; stainless steel spring; with Buna-N seal for zero leakage; flanged or grooved ends to match adjacent pipe.
4. Alternate Hydronic 2^-inch to 10-inch n.p.s.: Wafer or compact-wafer, spring loaded, lift- disc; FCI 74-1, Type I or Type II or Apco 9000; single or double plate; cast-iron (grey-iron) body; bronze, aluminum alloy or stainless steel disc and seats; stainless steel spring; with Buna-N seal for zero leakage; flanged ends or

flangeless with diameter made to fit within bolt circle.

K. Ball and Butterfly Valves -

1. In general, ball and butterfly valves shall -
a. be bi-directional and designed for dead-end service and bubble-tight shut-off.
b. have materials compatible with particular service and compatible to prevent electrolytic action.
2. Ball Valves for 2-inch n.p.s. and Smaller: MSS SP-110, two or three piece, bronze body, full-port, stainless steel stem and ball, PTFE or TFE seats, 600-psig minimum CWP rating and blow-out proof stem with solder-joint or threaded ends to match adjacent piping.
3. Butterfly Valves for 2^-inch n.p.s. and Larger: MSS SP-67, Type I, 200-psig CWP up to 12-inch n.p.s., 150-psig CWP for 14-inch n.p.s. and larger, ASTM A-536 or A-395 ductile iron body, ASTM B-148 aluminum-bronze disc, EPDM seat, stainless steel two-piece stem with positive stem retention, bushing and primary and secondary stem seals on upper and lower stems. Wafer, lug, flanged or grooved ends to match adjacent piping or as selected by Contractor and approved by Architect, Engineer and/or Owner.
4. AWWA C504 butterfly valves shall be Pratt Grondhog with buried service actuator.

L. Plug Valves -

1. 2-inch n.p.s. and Larger: MSS SP-78, lubricated-type, cast-iron (grey-iron) or resilient- seated, eccentric plug type similar in design to MSS SP-108, cast-iron (grey-iron) body with 175 psig CWP rating and ends to match adjacent piping.

M. Acceptable Valve Manufacturers: American Valve, Inc.; Bray International Inc.; Cincinnatti Valve Co.; Conbraco Industries, Inc., Appolo Div.; Cooper Cameron Corp., Cooper Cameron Valves Div.; Crane Co., Crane Valve Group, Center-Line, Crane Valves, Flowseal, Jenkins Valves and Stockham Div.; Dover Corp.; DynaQuip Controls; Flomatic Valves; Foster Valve Co.; GA Industries, Inc.; Grinnell Corp.; Hammond Valve; Kitz Corporation of America; KTM Products, Inc.; Metraflex Co.; Mueller Co., Flow Technologies and Steam Specialty; NIBCO Inc.; Nordstrom Valves, Inc.; Wm. Powell Co.; R&M Energy Systems; Tyco International, Ltd., Tyco Valves & Controls; Val-Matic Valve & Mfg. Corp.; Victaulic Co. of America; Walworth Co.; Watts Industries, Inc., Water Products Div.; Wheatley Gaso, Inc.

2.09 HYDRONIC SPECIFIC VALVES AND SPECIALTIES

A. Calibrated Balancing Valves -

1. 2-inch and Smaller: Bronze body, ball type, for FCU's and VAV's can be ball valve with memory stop, 125-psig working pressure, 250°F. maximum operating temperature, and having threaded ends. Valves shall have calibrated orifice or venturi, connections for portable differential pressure meter with integral seals, and be equipped with a memory stop to retain set position.
2. 2^-inch and Larger: Cast-iron or steel body, ball type, 125-psig working pressure, 250°F. maximum operating temperature, and having flanged or grooved connections. Valves shall have calibrated orifice or venturi, connections for portable differential pressure meter with integral seals, and be equipped with a memory stop to retain set position.
3. Similar or equal to Flow Design, Inc. Flowset Models "F" and "S".
4. Acceptable Manufacturers: Armstrong Pumps, Inc.; Flow Design, Inc.; Gerand Eng. Co.; Griswold Controls; ITT Bell & Gossett, ITT Fluid Tech. Corp.; Taco, Inc.

B. Safety Valves: Diaphragm-operated, bronze or brass body with brass and rubber, wetted, internal working parts; shall suit system pressure and heat capacity and shall comply with the ASME Boiler and Pressure Vessel Code, Section IV.

1. Acceptable Manufacturers: Amtrol, Inc., Armstrong Pumps, Inc.; Conbraco Ind., Inc.; ITT McDonnell & Miller Div., ITT Fluid Tech. Corp.; Kunkle Valve Div.; Spence Eng. Co., Inc.

C. Automatic Flow-Control Valves: Gray-iron body, factory set to maintain constant flow with plus or minus 5 percent over system pressure fluctuations, and equipped with a readout kit including flow meter, probes, hoses, flow charts, and carrying case. Each valve shall have an identification tag attached by chain, and be factory marked with the zone identification, valve number, and flow rate. Valve shall be line size and one of the following designs -

1. Gray-iron or brass body, designed for 175 psig at 200°F. with stainless-steel piston and spring.
2. Brass or ferrous-metal body, designed for 300 psig at 250°F. with corrosion-resistant, tamperproof, self-cleaning, piston-spring assembly easily removable for inspection and replacement.
3. Combination assemblies, including bronze ball valve and brass alloy control valve, with stainless-steel piston and spring, fitted with pressure and temperature test valves, and designed for 300 psig at 250°F.
4. Similar or equal to Flow Design, Inc. AutoFlow Models.
5. Acceptable Manufacturers: Flow Design, Inc.; Griswold Controls.

D. Manual Air Vent: Bronze body and nonferrous internal parts; 150-psig working pressure; 225°F. operating temperature; manually operated with screwdriver or thumbscrew; with 1/8-inch n.p.s. discharge connection and 1/2-inch n.p.s. inlet connection.

E. Automatic Air Vent: Designed to vent automatically with float principal; cast iron body and stainless steel internal parts; 150-psig working pressure; 240°F. operating temperature; with 1/4- inch n.p.s. discharge

connection and 1/2-inch n.p.s. inlet connection.

F. Tangential-Type Air Separators: Welded black steel; ASME constructed and labeled for 125-psig minimum working pressure and 375°F. maximum operating temperature; perforated stainless- steel air collector tube designed to direct released air into high capacity air vent; tangential inlet and outlet connections; threaded connections for 2-inch n.p.s. and smaller; flanged connections for 2^-inch n.p.s. and larger; threaded blowdown connection and accessible port to facilitate routine cleaning of the strainer. Provide units in sizes for full-system flow capacity.

1. Acceptable Manufacturers: Amtrol, Inc., Armstrong Pumps, Inc.; ITT Bell & Gossett, ITT Fluid Tech. Corp.; The John Wood Co.

G. Y-Pattern Strainers: 125-psig working pressure; cast-iron body (ASTM A-126, Class B), flanged ends for 2^-inch n.p.s. and larger, threaded connections for 2-inch n.p.s. and smaller, bolted cover, perforated stainless-steel basket, and bottom drain connection with drain valve.

H. Direct Buried Butterfly Valves: Shall be cast iron body with 5-mil epoxy coating; with ductile iron disc, resilient seats, stainless steel stem and stem nut. Include a minimum of 200 psig working pressure design, interior coating according to AWWA C550, and restrained mechanical joint ends.

1. Valve operators shall be enclosed, self-locking, worm gear type, water proof, factory lubricated and tested per the requirements of AWWA C504. Housings shall be ductile iron and shall be for buriable construction with 2-inch square AWWA nut inputs. All units shall have adjustable open and closed position stops. All bolts and nuts shall be 304 stainless steel.
2. Acceptable Manufacturers: Pratt Groundhog.

I. Valve Boxes: Ductile iron box with top section and cover with base large enough to fit over valve operator, and adjustable ductile iron extension of length required for depth of bury of valves. Design such that all moving parts are isolated from the soil.

1. Provide two steel tee-handle operating wrenches. Include tee handle with one pointed end, stem of length to operate valve and socket fitting valve operating hut.

2.10 DIELECTRIC ISOLATORS

A. Dielectric isolators shall be so designed that nonferrous materials do not come in contact with ferrous materials. These materials shall be isolated by the use of Teflon or nylon isolating materials made up in the form of screwed type unions of insulating gaskets and bolt sleeves and washers for standard flanged connection. Where it will not be necessary to disconnect these piping systems, the connections may be made by the use of Schedule 80 CPVC nipples, CPVC nylon or Teflon bushings. Units shall be selected for pressures and temperatures to be
encountered. Isolators with a discontinuity of all metal on the wetted inside perimeter surface of piping will be accepted.

B. Acceptable Manufacturers: Calpico, Inc.; Capital Manufacturing Co.; Central Plastics Co.; Epco Sales, Inc.; Hart Industries, International, Inc.; Perfection Corp.; Pipeline Seal and Insulator, Inc.; Precision Plumbing Products, Inc.; Sioux Chief Manufacturing Co., Inc.; Watts Industries, Inc.; Zurn Industries, Inc.

2.13 EXPANSION JOINTS

A. Metal-Bellows Expansion Joints: Comply with ASTM F-1120, circular-corrugated-bellows type with external tie rods.

1. Metal-Bellows Expansion Joints for Copper Piping: Multiple-ply phosphor-bronze bellows, copper pipe end connections, and brass shrouds.
2. Metal-Bellows Expansion Joints for Stainless-Steel Waterway: Single-ply stainless-steel bellows, stainless-steel-pipe end connections and steel shroud.
3. Metal-Bellows Expansion Joints for Steel Piping: Multiple-ply stainless-steel bellows, steel pipe end connections, and carbon-steel shroud.
4. Minimum pressure rating shall be 150 psig or 150% of the system operating pressure,

whichever is greater.

5. Configuration shall be single or double-bellows type with base, if required.
6. End connections shall be flanged.
7. Acceptable Manufacturers: Adsco Manufacturing, LLC.; Anamet, Inc.; Badger Industries; Expansion Joint Systems, Inc.; Flex-Hose Co., Inc.; Flexicraft Industries; Flex-Pression, Ltd.; Flex-Weld, Inc.; Hyspan Precision Products, Inc.; Metraflex, Inc.; Piping Technology & Products, Inc.; Proco Products, Inc.; Senior Flextronics, Inc., Pathway Division; Tozen America Corp.; Unaflex Inc.; WahlcoMetroflex.

B. Expansion Compensators: Double-ply corrugated steel, stainless-steel, or copper-alloy bellows in a housing with internal guides, antitorque device, and removable end clip for positioning.

1. Configuration for Copper Piping: Two-ply phosphor-bronze or stainless-steel bellows and bronze or stainless-steel shroud, with solder-joint or threaded end to match adjacent piping.
2. Configuration for Steel Piping: Two-ply stainless-steel bellows and carbon-steel shroud, with flanged, threaded or welded ends to match adjacent piping.
3. Minimum Pressure Rating: 150 psig or 150% of system operating temperature, whichever is greater.
4. Acceptable Manufacturers: Adsco Manufacturing, LLC.; Flexicraft Industries; Flex-Pression, Ltd.; Flex-Weld, Inc.; Hyspan Precision Products, Inc.; Metraflex, Inc.; Senior Flexonics, Inc., Pathway Division; Unaflex Inc.

C. Rubber Expansion Joints: Comply with ASTM F-1123, fabric-reinforced rubber with external control rods and complying with FSA's "Technical Handbook: Non-Metallic Expansion Joints and Flexible Pipe Connectors."

1. Arch type shall be multiple arches.
2. Spherical type shall be multiple spheres.
a. Minimum Pressure and Temperature Ratings for 1^-inch n.p.s. to 4-inch n.p.s.: 150 psig at 220°F.
b. Minimum Pressure and Temperature Ratings for 5-inch n.p.s. and 6-inch n.p.s.: 140 psig at 200°F.
c. Minimum Pressure and Temperature Ratings for 8-inch n.p.s. to 12-inch n.p.s.: 140 psig at 180°F.
3. Material shall be BR, Buna-N, CR, CSM, or EPDM, subject to compliance with UL flame spread and smoke developed requirements of materials located in occupied spaces.
4. End connections shall be full-faced, integral, steel flanges with steel retaining rings.
5. Acceptable Manufacturers: Flex-Hose Co., Inc.; Flexicraft Industries; Flex-Weld, Inc.; Garlock Sealing Technologies; General Rubber Corp.; Mason Industries, Inc., Mercer Rubber Co.; Metraflex, Inc.; MG Piping Products Co.; Proco Products, Inc.; Red Valve Company, Inc.; Senior Flexonics, Inc., Pathway Division.; Tozen America Corp.; Unaflex Inc.; Vibration Mountings & Controls, Inc.

D. Flexible-Hose Expansion Joints: Manufactured assembly with two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose; with inlet and outlet elbow fittings, corrugated-metal inner hoses, and braided outer sheaths.

1. Flexible-Hose Expansion Joints for Copper Piping: Copper-alloy fittings with solder-joint or threaded end connections to match adjacent pipe.
a. 2-inch n.p.s. and Smaller: Bronze hoses and single-braid bronze sheaths with 450 psig at 70°F. and 340 psig at 450°F. ratings.
b. 2-1/2-inch n.p.s. to 4-inch n.p.s.: Stainless-steel hoses and single-braid, stainless-steel sheaths with 300 psig at 70°F. and 225 psig at 450°F. ratings.
2. Flexible-Hose Expansion Joints for Steel Piping: Carbon-steel fittings with threaded end connections for 2-inch n.p.s. and smaller and flanged or welded end connections for 2^- inch n.p.s. and larger.
a. 2-inch n.p.s. and Smaller: Stainless-steel hoses and single-braid, stainless-steel sheaths with 450 psig at 70°F. and 325 psig at 600°F. ratings.
b. 2-1/2-inch n.p.s. to 6-inch n.p.s.: Stainless-steel hoses and single-braid, stainless-steel sheaths with 200 psig at 70°F. and 145 psig at 600°F. ratings.
c. 8-inch n.p.s. to 12-inch n.p.s.: Stainless-steel hoses and single-braid, stainless-steel sheaths

with 125 psig at 70°F. and 90 psig at 600°F. ratings.

3. Acceptable Manufacturers: Flex-Hose Co., Inc.; Flexicraft Industries.; Flex-Pression, Ltd.; Metraflex, Inc.

E. Packed Slip Expansion Joints: Comply with ASTM F-1007, carbon-steel, packing type designed for repacking under pressure and pressure rated for 250 psig at 400°F. minimum. Include asbestos-free PTFE packing, compound limit stops, and drip connection if used for steam piping.

1. Configuration shall be single- and double-joint class with base, if required.
2. End connections shall be flanged or weld ends to match piping system.
3. Acceptable Manufacturers: Adsco Manufacturing, LLC.; Advanced Thermal Systems, Inc.; Hyspan Precision Products, Inc.

F. Flexible Ball Joints: Carbon-steel assembly with asbestos-free composition packing, designed for 360-degree rotation and angular deflection, and 250 psig at 400°F. minimum pressure rating; complying with ASME Boiler and Pressure Vessel Code: Section II, "Materials," and with ASME B31.9, "Building Services Piping," for materials and design of pressure-containing parts and bolting.

1. Angular Deflection for 6-inch n.p.s. and Smaller: 30-degree minimum.
2. Angular Deflection for 8-inch n.p.s. and Larger: 15-degree minimum.
3. End Connections for 2-inch n.p.s. and Smaller: Threaded.
4. End Connections for 2^-inch n.p.s. and Larger: Flanged.
5. Acceptable Manufacturers: Advanced Thermal Systems, Inc.; Hyspan Precision Products, Inc. or equal

2.14 ALIGNMENT GUIDES

A. Steel, factory fabricated, with bolted two-section outer cylinder and base for alignment of piping and two-section guiding spider for bolting to pipe.

B. Acceptable Manufacturers: Adsco Manufacturing, LLC.; Advanced Thermal Systems, Inc.; Flex-Hose Co., Inc.; Flexicraft Industries.; Flex-Weld, Inc.; Hyspan Precision Products, Inc.; Metraflex, Inc.; Piping Technology & Products, Inc.; Senior Flexonics, Inc., Pathway Division.

2.15 MATERIALS FOR ANCHORS

A. Steel Shapes and Plates: Comply with ASTM A-36.

B. Bolts and Nuts: Comply with ASME B18.10 or ASTM A-183, steel, hex head.

C. Washers: Comply with ASTM F-844, steel, plain, flat washers.

D. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, and tension and shear capacities appropriate for application.

1. Stud shall be threaded, zinc-coated carbon steel.
2. Expansion plug shall be zinc-coated steel.
3. Washer and nut shall be zinc-coated steel.

E. Chemical Fasteners: Insert-type-stud bonding system anchor for use with hardened portland cement concrete, and tension and shear capacities appropriate for application.

1. Bonding material shall comply with ASTM C-881, Type IV, Grade 3, 2-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
2. Stud shall comply with ASTM A-307, zinc-coated carbon steel with continuous thread on stud, unless otherwise indicated.
3. Washer and nut shall be zinc-coated steel.

F. Concrete: Portland cement mix, 3000 psi minimum. Refer to Division 3 Section "Cast-in-Place Concrete" for formwork, reinforcement, and concrete.

G. Grout: Comply with ASTM C-1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink, nonmetallic grout; suitable for interior and exterior applications and nonstaining, noncorrosive, and nongaseous, having a 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Materials to be used for the various building piping systems shall be as described in Article 2.02, this Section.

B. Select system components with pressure rating equal to or greater than system operating pressure.

3.2 PIPING SYSTEMS - INSTALLATION REQUIREMENTS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or

parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

F. Install belowground piping in accordance with Division 2 Section - "Hydronic Distribution."

G. Install belowground preinsulated piping systems in strict accordance with manufacturer's written instructions, including hydrostatic pressure testing.

H. Install piping indicated to be routed above the roof utilizing equipment support curbs with associated framing, tubing, unistrut and hangers as required or utilizing an engineered prefabricated system specifically designed for this purpose.

I. For hydronic systems, install drains, consisting of a tee fitting, 3/4-inch n.p.s. ball valve, and short 3/4-inch n.p.s. threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

J. Install piping at indicated slopes, or at slopes required by governing codes or authorities.

1. Install hydronic piping at a uniform grade of 0.2 percent upward in direction of flow.
2. Install condensate drain piping at a uniform grade of 1/8-inch per foot downward in direction of condensate flow.

K. Install piping free of sags and bends.

L. Reduce pipe sizes using eccentric reducer fitting installed with level side up. Install fittings for changes in direction and branch connections.

1. Unless otherwise indicated, install branch connections to hydronic mains using tee fittings in main pipe, with the takeoff coming out the bottom of the main pipe. For up-feed risers, install the takeoff coming out the top of the main pipe.

M. Anchor piping for proper direction of expansion and contraction.

N. Install strainers as listed below and elsewhere as indicated. Install 3/4-inch n.p.s. nipple and ball valve in blowdown connection of strainers 2-inch n.p.s. and larger; match size of blowdown connection for strainers smaller than 2-inch n.p.s.

1. Inlets of pumps.
2. Supply side of control valves as indicated on drawings or details.

O. Install escutcheons for penetrations of walls, ceilings, and floors according to the following -

1. New Piping -
a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type with spring clips.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast- brass type with polished chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
f. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed hinge and set screw.
g. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw.
h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
2. Existing Piping -
a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast- brass type with chrome-plated finish.
d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
e. Bare Piping in Unfinished Service Spaces: Split-plate, stamped steel type with concealed hinge and set screw.
f. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with set screw or spring clips.
g. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.

P. Sleeves are not required for core-drilled holes.

Q. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

R. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.
a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials -
a. Steel Pipe Sleeves: For pipes smaller than 6-inch n.p.s.
b. Steel Sheet Sleeves: For pipes 6-inch n.p.s. and larger, penetrating gypsum-board partitions.
c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 for sheet metal flashing and trim.
1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 for joint sealant materials and installation.

S. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron or galvanized steel "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

T. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron or galvanized steel "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

U. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials

V. Verify final equipment locations for roughing-in.

3.03 PIPING JOINT CONSTRUCTION

A. A full ream shall be provided for all cut piping and tubes. Remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using filler metal complying with AWS A5.8.

1. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide) during brazing to prevent scale formation.

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows -

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service

application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated -

1. Install unions, in piping 2-inch n.p.s. and smaller, adjacent to each valve and at final connection to each piece of equipment and elsewhere as indicated.
2. Install flanges, in piping 2-1/2-inch n.p.s. and larger, adjacent to flanged valves and at final connection to each piece of equipment and elsewhere as indicated.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

B. Make connections at terminal equipment according to the following, unless otherwise indicated.

1. Same size as equipment connections.
2. With control valves in accessible locations close to connected equipment.
3. With ports for pressure and temperature gages at coil inlet and outlet connections.
4. With bypass piping and globe valve around control valve (or valves, if control valves are in parallel).
5. With drip leg (dirt leg) at coil outlet.

3.5 VALVE EXAMINATION, APPLICATIONS AND INSTALLATION

A. Examination -

1. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
2. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
3. Examine threads on valve and mating pipe for form and cleanliness.
4. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
5. Do not attempt to repair defective valves; replace with new valves.

B. Applications -

1. For hydronic service, use the following valve types if otherwise not indicated -
   a. Shut-off Duty: Ball or butterfly valves.
   b. Throttling Duty: Angle, ball, butterfly, globe or plug valves.
2. For hydronic service, install shutoff duty valves at each branch connection to supply and return mains, at supply and return connection to each piece of equipment, unless only one piece of equipment is connected in the branch line. Install throttling duty valves at each branch connection to return mains, at return connections to each piece of equipment, and elsewhere as indicated.
3. Install calibrated balancing valves in the return water line of each heating or cooling element and elsewhere as required to facilitate system balancing.

4. Install check valves at each pump discharge and elsewhere as required to control flow direction.
5. If valves with specified CWP ratings are not available, provide similar valves with higher CWP rating.

C. Installation -

1. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
2. Locate valves for easy access and provide separate support where necessary.
3. Install valves in horizontal piping with stem at or above center of pipe.
4. Install valves in position to allow full stem movement.
5. Install chain wheel operators on valves 4-inch and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor elevation.
6. Install check valves for proper direction of flow and as required by specific manufacturer's written instructions.
7. Provide valve tags as required in Section

3.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Otherwise, install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install air separators in piping systems (typically heating water systems) as indicated on Drawings. Install automatic air vent with discharge piped to nearest floor drain. Install drain valve on units 2-inch n.p.s. and larger.

C. Install bypass chemical feeders in each hydronic system where indicated, in upright position with top of funnel not more than 48 inches above floor. Install feeder in minimum 3/4-inch n.p.s. bypass line, off supply and return mains, using full size, full-port ball valves on each side of feeder. Pipe 3/4-inch n.p.s. drain, with full size, full-port ball valve, from chemical feeder drain to nearest floor drain.

D. Install expansion tanks as indicated on Drawings. Vent and purge air from hydronic systems and insure tank is properly charged with air to suit system pressure requirements.

1. Support tank from floor or structure above with assemblies of sufficient strength to carry weight of tank, piping connections, and fittings, plus weight of a full tank of water. Do not overload building components and structural members.

3.8 PIPE EXPANSION FITTINGS AND LOOPS INSTALLATION

A. Install manufactured nonmetallic expansion joints according to FSA's "Technical Handbook: Non-Metallic Expansion Joints and Pipe Connectors."

B. Install expansion joints of sizes matching size of piping in which they are installed.

C. Install alignment guides to allow expansion and to avoid end-loading and torsional stress.

D. Pipe Bend and Loop Installation -

1. Install pipe bends and loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.
2. Attach pipe bends and loops to anchors.
a. Steel Anchors: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
b. Concrete Anchors: Attach by fasteners. Follow fastener manufacturer's written instructions.

E. Swing Connections -

1. Connect risers and branch connections to mains with at least five pipe fittings, including tee in main.
2. Connect risers and branch connections to terminal units with at least four pipe fittings, including tee in riser.
3. Connect mains and branch connections to terminal units with at least four pipe fittings, including tee in main.

F. Alignment-Guide Installation -

1. Install guides on piping adjoining pipe expansion joints and bends and loops.
2. Attach guides to pipe and secure to building structure.

G. Anchor Installation -

1. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.
2. Fabricate and install steel anchors by welding steel shapes, plates, and bars to piping and to structure. Comply with ASME B31.9 and AWS D1.1.
3. Construct concrete anchors of poured-in-place concrete of dimensions indicated and include embedded fasteners.
4. Install pipe anchors according to expansion-joint manufacturer's written instructions if expansion joints or compensators are indicated.
5. Use grout to form flat bearing surfaces for expansion fittings, guides, and anchors installed on or in concrete.

3.09 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows -

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush system with clean water. Clean strainers.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of over pressure during test.

B. Perform the following tests on hydronic piping -

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.

2. While filling system, use vents installed at high points of system to release trapped air. Use drains installed at low points for complete draining of liquid.
3. Check expansion tanks to determine that they are not air bound and that system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the design pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed either 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A of ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 2 hours, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

3.10 ADJUSTING

A. Mark calibrated nameplates of pump discharge valves after hydronic system balancing has been completed, to permanently indicate final balanced position.

B. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

C. Perform these adjustments before operating hydronic systems -

1. Open manual isolation valves to fully open position.
2. Check pump for proper direction of rotation.
3. Set automatic fill valves for required system pressure.
4. Check air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Check operation of automatic bypass valves.
7. Check and set operating temperatures to design requirements.
8. Verify lubrication of motors and bearings.

3.11 PAINTING

A. Painting of piping systems for identification and for protection when left exposed to the weather is specified by architect.

B. Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes hangers and supports for mechanical system piping and equipment.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Design heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

1.4 SUBMITTALS

A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers. Include design calculations and indicate size and characteristics of components and fabrication details.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support and trapeze by a qualified professional engineer.

1. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of hangers and supports that are similar to those indicated for this Project in material, design, and extent.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pipe Hangers:

a. Globe Pipe Hanger Products, Inc.
b. Grinnell Corp.
c. Michigan Hanger Co., Inc.

2.2 MANUFACTURED UNITS

A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components. Refer to "Hanger and Support Applications" Article in Part 3 for where to use specific hanger and support types.

1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.

1. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

2.3 MISCELLANEOUS MATERIALS

A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

B. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger requirements are specified in Sections specifying equipment and systems.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.

C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
3. Extension Hinged Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.

D. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.

E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

F. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
3. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
4. C-Clamps (MSS Type 23): For structural shapes.
5. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
6. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
7. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching tobottom of steel I-beams for heavy loads, with link extensions.
8. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.

H. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).

3.2 HANGER AND SUPPORT INSTALLATION

A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.

1. Field assemble and install according to manufacturer's written instructions.

C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

D. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

G. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.

I. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
c. Do not exceed pipe stress limits according to ASME B31.9.

2. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
b. NPS 4: 12 inches long and 0.06 inch thick.
c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.

6. Insert Material: Length at least as long as protective shield.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

3.4 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

END OF SECTION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Pipe, and equipment hangers, supports and associated anchors.
B. Sleeves and seals.
C. Flashing and sealing equipment and pipe stacks.

1.02 SUBMITTALS

A. Submit shop drawings and product data under provisions of specification.
B. Indicate hanger and support framing and attachment methods.

PART 2 - PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch Malleable iron, adjustable swivel, split ring.
B. Hangers for Pipe Sizes 2 to 4 Inches Carbon steel, adjustable, clevis.
C. Hangers for Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for pipe sizes 6 inches and over.
E. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
F. Wall Support for Pipe Sizes 4 Inches and over: adjustable steel yoke and cast iron roll.
G. Vertical Support: Steel riser clamp.
H. Floor Support for Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.
I. Floor Support for Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

J. Roof Pipe Supports and Hangers:

Galvanized Steel Channel System as manufactured by Portable Pipe Hangers, Inc. or approved equal.
For pipes 2-1/2" and smaller – Type PP10 with roller
For pipes 3" through 8" – Type PS
For multiple pipes – Type PSE - Custom

K. Copper Pipe Support and Hangers: Electro-galvanized with thermoplastic elastomer cushions; Unistrut "Cush-A-Clamp" or equal. Hangers: Plastic coated; Unistrut or equal.
L. For installation of protective shields refer to specification section 15140-3.03.
M. Shields for Vertical Copper Pipe Risers: Sheet lead.

N. Pipe Rough-In Supports in Walls/Chases: Provide preformed plastic pipe supports, Sioux Chief "Pipe Titan", Holdrite or equal.

2.02 HANGER RODS

A. Galvanized Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.03 INSERTS

A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.04 FLASHING

A. Metal Flashing: 20 gage galvanized steel.
B. Lead Flashing: 4 lb. /sq. ft. sheet lead for waterproofing; 1 lb. /sq. ft. sheet lead for soundproofing.
C. Caps: Steel, 20 gage minimum; 16 gage at fire resistant elements.

D. Coordinate with roofing contractor/architect for type of flashing on metal roofs.

2.05 EQUIPMENT CURBS

A. Fabricate curbs of hot dipped galvanized steel.

2.06 SLEEVES

A. Sleeves for Pipes through Non-fire Rated Floors: Form with 18 gage galvanized steel, tack welded to form a uniform sleeve.
B. Sleeves for Pipes through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe, schedule 40.
C. Sleeves for Pipes through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated steel sleeves including seals, UL listed.
D. Sleeves for Round Ductwork: Form with galvanized steel.
E. Sleeves for Rectangular Ductwork: Form with galvanized steel.
F. Fire Stopping Insulation: Glass fiber type, non-combustible, U.L. listed.
G. Caulk: Paintable 25-year acrylic sealant.
H. Pipe Alignment Guides: Factory fabricated, of cast semi-steel or heavy fabricated steel, consisting of bolted, two-section outer cylinder and base with two-section guiding spider that bolts tightly to pipe. Length of guides shall be as recommended by manufacturer to allow indicated travel.

2.07 FABRICATION

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
B. Design hangers without disengagement of supported pipe.
C. Design roof supports without roof penetrations, flashing or damage to the roofing material.

2.08 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

PART 3 - EXECUTION

3.01 INSERTS

A. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams. Coordinate with structural engineer for placement of inserts.
B. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

C. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.
D. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab. Verify with structural engineer prior to start of work.

3.02 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

PIPE SIZE	MAX. HANGER SPACING	HANGER DIAMETER
(Steel Pipe)		
1/2 to 1-1/4 inch	7'-0"	3/8"
1-1/2 to 3 inch	10'-0"	3/8"
4 to 6 inch	10'-0"	1/2"
8 to 10 inch	10'-0"	5/8"
12 to 14 inch	10'-0"	3/4"
15 inch and over	10'-0"	7/8"
(Copper Pipe)		
1/2 to 1-1/4 inch	5'-0"	3/8"
1-1/2 to 2-1/2 inch	8'-0"	3/8"
3 to 4 inch	10'-0"	3/8"
6 to 8 inch	10'-0"	1/2"
(Cast Iron)		
2 to 3 inch	5'-0"	3/8"
4 to 6 inch	10'-0"	1/2"
8 to 10 inch	10'-0"	5/8"
12 to 14 inch	10'-0"	3/4"
15 inch and over	10'-0"	7/8"
(PVC Pipe)		
1-1/2 to 4 inch	4'-0"	3/8"
6 to 8 inch	4'-0"	1/2"
10 and over	4'-0"	5/8"

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
C. Place a hanger within 12 inches of each horizontal elbow and at the vertical horizontal transition.
D. Use hangers with 1-1/2 inch minimum vertical adjustment.
E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
H. Support riser piping independently of connected horizontal piping.
I. Install hangers with nut at base and above hanger; tighten upper nut to hanger after final installation adjustments.
J. Portable pipe hanger systems shall be installed per manufacturers' instructions.
K. Distances between supports are maximum distance. Supports shall be provided to carry the pipe/equipment load.

3.03 Insulated Piping: Comply with the following installation requirements.

A. Clamps: Attach galvanized clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.

B. Saddles: Install galvanized protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.

C. Shields: Install protective shields MSS Type 40 on cold and chilled water piping that has vapor barrier. Shields shall span an arc of 180 degrees and shall have dimensions in inches not less than the following:

NPS	LENGTH	THICKNESS
1/4 THROUGH 3-1/2	12	0.048
4	12	0.060
5 & 6	18	0.060
8 THROUGH 14	24	0.075
16 THROUGH 24	24	0.105

D. Piping 2" and larger provide galvanized sheet metal shields with calcium silicate at hangers/supports.

E. Insert material shall be at least as long as the protective shield.

F. Thermal Hanger Shields: Install where indicated, with insulation of same thickness as piping.

3.04 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of concrete.
B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
C. Construct support of steel members. Brace and fasten with flanges bolted to structure.
D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.05 FLASHING

A. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
B. Flash vent and soil pipes projecting 8 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter flash and seal.
C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.
D. Seal floor shower mop sink and all other drains watertight to adjacent materials.
E. Provide curbs for mechanical roof installations 8 inches minimum high above roofing surface. Contact architect for all flashing details and roof construction. Seal penetrations watertight.

3.06 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.
B. Extend sleeves through floors minimum one inch above finished floor level. Caulk sleeves full depth with fire rated thermfiber and 3M caulking and provide floor plate.
C. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with U.L. listed fire stopping insulation and caulk seal air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
D. Fire protection sleeves may be flush with floor of stairways.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:

1. Balancing airflow and water flow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
2. Adjusting total HVAC systems to provide indicated quantities.
3. Measuring electrical performance of HVAC equipment.
4. Setting quantitative performance of HVAC equipment.
5. Verifying that automatic control devices are functioning properly.
6. Reporting results of the activities and procedures specified in this Section.

B. Related Sections include the following:

1. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.
2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

C. Testing, adjusting, and balancing (TAB) of the air conditioning systems, related ancillary equipment and domestic water system will be performed by an impartial technical TAB firm selected and employed by the Owner.

D. As a part of this Contract, the Contractor and/or Mechanical Subcontractor shall make any changes in the sheaves, belts, dampers, valves, etc. required for correct balance as required by the TAB firm, at no additional cost to the Owner.

1. The Contractor and/or Mechanical Subcontractor shall ship one (1) unit of each size and type of variable air volume terminal boxes to the TAB firm for leak and sound testing in his shop prior to installation.

E. The Mechanical Subcontractor shall provide and coordinate services of qualified, responsible subcontractors, suppliers and personnel as required to correct, repair, replace any and all deficient items or conditions found during the testing, adjusting and balancing period.

F. In order that all systems may be properly tested, balanced, and adjusted as required herein by these Specifications, the Contractor shall start-up and check-out all systems at his expense for the length of time necessary to properly verify their completion and readiness for TAB. This length of time shall be acceptable to the Inspector.

G. Contract completion schedules shall provide sufficient time to permit the completion of TAB services prior to Owner occupancy.

H. The Drawings and Specifications have indicated valves, dampers, and miscellaneous adjustment devices for the purpose of adjustment to obtain optimum operating conditions, and it

will be the responsibility of the Contractor to install these devices in a manner that will leave them accessible and readily adjustable. Should any such device not be readily accessible, the Contractor shall provide access as requested by the TAB firm. Also, any malfunction encountered by TAB personnel and reported to the Contractor or the Inspector shall be corrected by the Contractor immediately so the balancing work can proceed

1.2 MATERIAL AND WORKMANSHIP

A. The scope of the TAB work as defined herein is indicated in order that the Contractor and/or Mechanical Subcontractor will be appraised of the coordination, adjustment, and system modification which will be required under the project work in order to complete the Owner's requirements for final TAB. The TAB firm will not have a contractual relationship with this Contractor but will be responsible to the Inspector and the Owner for the satisfactory execution of the TAB work. The Contractor shall allow sufficient funds in the project cost estimate and bid proposal to cover all work which may be required in the TAB phases as defined herein and as may be necessary for the completion of the TAB work as defined by the TAB firm.

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

K. Test: A procedure to determine quantitative performance of a system or equipment.

L. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

M. AABC: Associated Air Balance Council.

N. CTI: Cooling Tower Institute.

O. NEBB: National Environmental Balancing Bureau.

P. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.4 SUBMITTALS

A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.

B. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.

C. Warranty: Submit 2 copies of special warranty specified in the "Warranty" Article below.

1.5 QUALITY ASSURANCE

A. Agent Qualifications for larger projects: Engage a testing, adjusting, and balancing agent certified by AABC.

B. Agent Qualifications for smaller projects: Engage a testing, adjusting, and balancing agent certified by NEBB.

C. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

D. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing."

E. Testing, Adjusting, and Balancing Reports: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

F. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards.

G. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

H. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.6 PROJECT CONDITIONS

A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.7 RESPONSIBILITY OF CONTRACTOR

A. Contractor shall have the building and air conditioning systems in complete operational readiness and shall perform all other items as described hereinafter to assist the TAB Firm in performing the balancing, testing, and adjusting of the air and hydronic systems. He shall promptly correct deficiencies of material and workmanship identified as delaying completion of TAB work. The items shall include the following:

1. Air Distribution Systems:
    a. Verify installation for conformity to design. All supply, return and exhaust ducts terminated.
    b. All volume, splitter, extractor and fire, smoke and combination fire/smoke dampers properly located and functional. Dampers shall provide tight closure and full opening, smooth and free operation.
    c. All supply, return, exhaust, transfer grilles, registers, diffusers and terminal units installed, leak tested and operational.
    d. Air handling systems, units and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., shall be blanked and/or sealed to eliminate excessive by-pass or leakage of air.
    e. All fans (supply, return, relief and exhaust) operating and verified for freedom from vibration, proper fan rotation and belt tension; overload heater elements to be of proper size and rating; and clean filters installed.
2. Water Circulating Systems -
    a. Check and verify pump alignment and rotation.
    b. Water systems shall be cleaned by circulation and all strainers cleaned prior to normal operation. Refer to Section 15685.
    c. Check each pump motor amperage and voltage to ensure readings do not exceed nameplate rating,
    d. Verify electrical overload heater elements to be of proper size and ratings,
    e. All water circulating systems shall be full and free of air; all vents installed at high points of systems.
    f. Check and set operating temperatures of heat exchangers to design requirements.
3. Automatic Controls -
    a. Verify that all control components are installed in accordance with project requirements and that a point to point check of all DDC and computer controls has been completed and that all controls are functional, including all electrical interlocks, damper sequences, air and water resets, fire and freeze stats, etc.
    b. Verify that all controlling instruments are calibrated and set for design conditions.
4. Tabulated Data -
    a. The motor amperages, voltages and overload heater size of each piece of electrically driven equipment, including exhaust fans, shall be recorded showing "actual" and "nameplate" data and submitted to the Owner prior to balancing.

B. The Contractor and the suppliers of the equipment installed shall all cooperate with the TAB Firm to provide all necessary data on the design and proper application of the system

components and shall furnish all labor and material required to eliminate any deficiencies or malperformance. Furnish a list of all motors with name plate data and size of overload heater installed with motor amperage during operation.

C. During the balancing, the temperature regulation shall be adjusted for proper relationship between controlling instruments *and* calibrated by the EMS Subcontractor using data submitted by the TAB Firm. The correctness of the final setting shall be proved by taking hourly readings for a period of 3 successive eight hour days, in a typical room on each separately controlled zone. The total variation shall not exceed 2 degrees from the preset medium temperature during the entire temperature survey period.

D. In all fans systems, the air quantities shown on the plans may be varied as required to secure a maximum temperature variation of 2 degrees within each separately controlled space, but the total air quantity indicated for each zone must be obtained. It shall be the obligation of the Contractor to furnish or revise fan drives and/or motors if necessary, without cost to the Owner, to attain the specified air volumes

E. The Contractor shall assist the TAB Firm in performing 3 inspections within 90 days after occupancy of the building to insure that satisfactory conditions are being maintained throughout and to satisfy any unusual condition.

F. The Contractor shall assist the TAB Firm in performing inspections in the building during the opposite season from that in which the initial adjustments were made to produce optimum operation of the systemic components, during that season, so that the proper conditions in each conditioned space are also maintained during this opposite season

1.8 RESPONSIBILITY OF TAB FIRM

A. The services of testing, adjusting and balancing of the heating, ventilating, and air conditioning systems will be performed by an independent technical firm or balancing company operating under the same firm name for five years with a minimum of five years specialized experience in the field of air conditioning system balancing, and possessing calibrated instruments, qualified Engineers, and skilled technicians to perform all required tests.

B. The TAB personnel shall check, adjust, and balance the components of the air conditioning system which will result in optimum noise, temperature, and air flow conditions in the conditioned spaces of the building while the equipment for the system is operating economically. This is intended to be accomplished after the system components are installed and operating as provided for in the contract documents, which is the responsibility of the Project Contractor. Variable air volume systems shall be balanced in accordance with AABC Manual #MN-7 "Variable Volume System Standards."

C. TAB to conduct leakage test in TAB firm's testing lab for one large and one small terminal box, to be delivered by Contractor.

D. The tests shall demonstrate the specified capacities and operation of all equipment and materials comprising the systems. Such tests shall be made as are deemed necessary by the Architect to indicate the fulfillment of the contract. The TAB Firm shall then make available to the Engineer such instruments and technicians as are required for spot checks of the systems.

E. The TAB Firm will not instructor direct the Contractor in any of the work. Any proposed changes or revisions in the work shall be submitted to the Architect in writing. The Architect will process the proposal as appropriate.

1.9 BALANCING SERVCES

A. The TAB Firm, Architect and Owner will observe the installation of heating and cooling pipe systems, sheet metal work, temperature controls and other component parts of the heating, air conditioning, and ventilating systems. The observation of the work will cover that part relating to proper arrangement and adequate provisions for the testing and balancing. The observations shall be performed periodically as the work progresses.

B. Upon formal notification of completion of the installation and start-up of the mechanical equipment by the Contractor, the TAB Firm will balance, test, and adjust the systemic components to obtain optimum conditions in each conditioned space in the building.

C. The TAB Firm shall be responsible for inspecting, balancing, adjusting, testing, and logging the data on the performance of fans, all dampers in the duct systems, all air distribution devices or heat exchangers, and the flows of (chilled and heated or) water through all coils.

D. The TAB Firm will, fourteen (14) days prior to Final Air Balance Inspection, prepare seven (7) copies of the completed Test and Balance Report. The Report shall be complete with logs, data, and records as required herein and all logs, data, and records shall be typed, produced on white bond paper, and bound with staples and tape. The Report shall be certified and approved by the professional principle Engineer of the TAB Firm and his seal shall appear on the first page of each copy. Transmit one (1) copy direct to the Owner's Representative and the remaining six (6) copies to the Architect. The Architect will review and approve the report. Upon approval, two (2) copies will be submitted to the Owner's Representative and two copies transmitted to the Contractor.

1.10 COORDINATION

A. Systems shall be complete and in operational readiness prior to notifying the Owner that the project is ready for the services of the TAB Firm and the Contractor shall so certify in writing to the Owner that such a condition exists.

B. Should the Owner be so notified and the TAB work commenced and the systems are found to not be in readiness or a dispute occurs as to the readiness of the systems, the Contractor shall request an inspection be made by the Owner. This inspection shall establish to the satisfaction of the represented parties whether or not the systems meet the basic requirements for TAB services. Should the inspection reveal the notification to have been premature, all costs of the inspection and work previously accomplished by the TAB Firm shall be paid for by the Contractor. Furthermore, such items as are not ready for TAB services shall be completed, placed in operational readiness and TAB services shall again be requested. Complete, operational readiness, prior to commencement of TAB services, shall include the work describe in 1.7 A.

1.11 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

C. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.12 WARRANTY

A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine project record documents described in Division 1.

D. Examine Architect's and Engineer's design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and

fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine terminal units, such as variable-air-volume boxes and mixing boxes, to verify that they are accessible and their controls are connected and functioning.

L. Examine strainers for clean screens and proper perforations.

M. Examine 3-way valves for proper installation for their intended function of diverting or mixing fluid flows.

N. Examine equipment for installation and for properly operating safety interlocks and controls.

O. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices operate by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
4. Automatic modulating and shutoff valves, including 2-way valves and 3-way mixing and diverting valves, are properly connected.
5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
9. Interlocked systems are operating.
10. Changeover from heating to cooling mode occurs according to design values.

P. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 PREPARATION

A. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.

8. Windows and doors can be closed so design conditions for system operations can be met.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC national standards and this Section.

B. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

C. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

D. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling unit components.

3.5 CONSTANT-VOLUME AIR SYSTEMS' BALANCING PROCEDURES

A. The procedures in this Article apply to constant-volume supply-, return-, and exhaust-air systems.

B. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

    a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.

2. Measure static pressure across each air-handling unit component.

    a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
4. Adjust fan speed higher or lower than design with the approval of the Architect. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.

C. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

    a. Where sufficient space in submains and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submains and branch ducts to design airflows within specified tolerances.

D. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or the outlet manufacturer's written instructions and calculating factors.

E. Adjust terminal outlets and inlets for each space to design airflows within specified tolerances of design values. Make adjustments using volume dampers rather than extractors and the dampers at the air terminals.

1. Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 VARIABLE-AIR-VOLUME SYSTEMS' ADDITIONAL PROCEDURES

A. Compensating for Diversity: When the total airflow of all terminal units is more than the fan design airflow volume, place a selected number of terminal units at a maximum set-point airflow condition until the total airflow of the terminal units equals the design airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Dependent, Variable-Air-Volume Systems without Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Balance systems similar to constant-volume air systems.
2. Set terminal units and supply fan at full-airflow condition.
3. Adjust inlet dampers of each terminal unit to design airflow and verify operation of the static-pressure controller. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
4. Readjust fan airflow for final maximum readings.
5. Measure operating static pressure at the sensor that controls the supply fan, if one is installed, and verify operation of the static-pressure controller.
6. Set supply fan at minimum airflow if minimum airflow is indicated. Measure static pressure to verify that it is being maintained by the controller.
7. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.

8. Measure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.

C. Pressure-Dependent, Variable-Air-Volume Systems with Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set system at maximum design airflow by setting the required number of terminal units at minimum airflow. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.
2. Adjust supply fan to maximum design airflow with the variable-airflow controller set at maximum airflow.
3. Set terminal units being tested at full-airflow condition.
4. Adjust terminal units starting at the supply-fan end of the system and continuing progressively to the end of the system. Adjust inlet dampers of each terminal unit to design airflow. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
5. Adjust terminal units for minimum airflow.
6. Measure static pressure at the sensor.
7. Measure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.

3.7 FUNDAMENTAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check expansion tank liquid level.
3. Check makeup-water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation and set at design flow.
5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type, unless several terminal valves are kept open.
6. Set system controls so automatic valves are wide open to heat exchangers.
7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.8 HYDRONIC SYSTEMS' BALANCING PROCEDURES

A. Determine water flow at pumps. Use the following procedures, except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Verify with the pump manufacturer that this will not damage pump. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on the manufacturer's pump curve at zero flow and confirm that the pump has the intended impeller size.
2. Check system resistance. With all valves open, read pressure differential across the pump and mark the pump manufacturer's head-capacity curve. Adjust pump discharge valve until design water flow is achieved.
3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on the pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
4. Report flow rates that are not within plus or minus 5 percent of design.

B. Set calibrated balancing valves, if installed, at calculated presettings.

C. Measure flow at all stations and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

D. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than design flow.

E. Adjust balancing stations to within specified tolerances of design flow rate as follows:

1. Determine the balancing station with the highest percentage over design flow.

2. Adjust each station in turn, beginning with the station with the highest percentage over design flow and proceeding to the station with the lowest percentage over design flow.
3. Record settings and mark balancing devices.

F. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures, including outdoor-air temperature.

G. Measure the differential-pressure control valve settings existing at the conclusions of balancing.

3.9 VARIABLE-FLOW HYDRONIC SYSTEMS' ADDITIONAL PROCEDURES

H. Systems installed with pressure independent control valves shall not require hydronic system balancing.

Systems installed with pressure independent valves shall require verification of flow for 25% of the total installed product. Exact locations of tested product to be coordinated with the design engineer.

3.10 MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating if high-efficiency motor.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.11 HEAT-TRANSFER COILS

A. Electric-Heating Coils: Measure the following data for each coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperatures at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kW at full load.
6. Fuse or circuit-breaker rating for overload protection.

3.12 TEMPERATURE TESTING

A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure outside-air, wet- and dry-bulb temperatures.

3.13 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Verify free travel and proper operation of control devices such as damper and valve operators.

F. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water-flow measurements. Note the speed of response to input changes.

G. Confirm interaction of electrically operated switch transducers.

H. Confirm interaction of interlock and lockout systems.

I. Verify main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine if the system operates on a grounded or nongrounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.14 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply and Exhaust Fans: Plus 5 to plus 10 percent.
2. Air Outlets and Inlets: 0 to minus 10 percent.
3. Cooling-Water Flow Rate: 0 to minus 5 percent.

3.15 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to the certified field report data, include the following:

1. Pump curves.
2. Fan curves.

3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of testing, adjusting, and balancing Agent.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of testing, adjusting, and balancing Agent who certifies the report.
10. Summary of contents, including the following:

    a. Design versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

11. Nomenclature sheets for each item of equipment.
12. Data for terminal units, including manufacturer, type size, and fittings.
13. Notes to explain why certain final data in the body of reports vary from design values.
14. Test conditions for fans and pump performance forms, including the following:

    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings, including settings and percentage of maximum pitch diameter.
    f. Settings for supply-air, static-pressure controller.
    g. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present with single-line diagrams and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.

F. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data: Include the following:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.

e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches (mm), and bore.
i. Number of belts, make, and size.
j. Number of filters, type, and size.

2. Motor Data: Include the following:

a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.

3. Test Data: Include design and actual values for the following:

a. Total airflow rate in cfm (L/s).
b. Total system static pressure in inches wg (Pa).
c. Fan rpm.
d. Discharge static pressure in inches wg (Pa).
e. Preheat coil static-pressure differential in inches wg (Pa).
f. Cooling coil static-pressure differential in inches wg (Pa).
g. Heating coil static-pressure differential in inches wg (Pa).
h. Outside airflow in cfm (L/s).
i. Return airflow in cfm (L/s).
j. Outside-air damper position.
k. Return-air damper position.

G. Hydronic Heating Coils Test Reports: For hydronic heating coils installed in central-station air-handling units, include the following:

1. Unit Data: Include the following:

a. System identification.
b. Location.
c. Coil identification.
d. Capacity in Btuh.
e. GPM.

2. Test Data: Include design and actual values for the following:

a. Heat output in Btuh.
b. Airflow rate in cfm (L/s).
c. Air velocity in fpm (m/s).
d. Entering-air temperature in deg F (deg C).
e. Leaving-air temperature in deg F (deg C).

H. Fan Test Reports: For exhaust fans, include the following:

1. Fan Data: Include the following:

a. System identification.
b. Location.
c. Make and type.

d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.

2. Motor Data: Include the following:

a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Number of belts, make, and size.

3. Test Data: Include design and actual values for the following:

a. Total airflow rate in cfm (L/s).
b. Total system static pressure in inches wg (Pa).
c. Fan rpm.
d. Discharge static pressure in inches wg (Pa).
e. Suction static pressure in inches wg (Pa).

I. Air-Terminal-Device Reports: For terminal units, include the following:

1. Unit Data: Include the following:

a. System and air-handling unit identification.
b. Location and zone.
c. Area served.
d. Air-terminal-device make.
e. Air-terminal-device number from system diagram.
f. Air-terminal-device type and model number.
g. Air-terminal-device size.

2. Test Data: Include design and actual values for the following:

a. Airflow rate in cfm (L/s).
b. Air velocity in fpm (m/s).
c. Space temperature in deg F (deg C).
d. Heating KW
e. Amp Drawn for each stage

3.16 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions.

1.2 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:

1. Equipment nameplates.
2. Equipment markers.
3. Access panel and door markers.
4. Pipe markers.
5. Duct markers.
6. Valve tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.

1. Data:

a. Manufacturer, product name, model number, and serial number.
b. Capacity, operating and power characteristics, and essential data.
c. Labels of tested compliances.

2. Location: Accessible and visible.
3. Fasteners: As required to mount on equipment.

B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.

1. Terminology: Match schedules as closely as possible.
2. Data:

a. Name and plan number.
b. Equipment service.
c. Design capacity.
d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

3. Size: 2-1/2 by 4 inches (64 by 100 mm) for control devices, dampers, and valves; 4-1/2 by 6 inches (115 by 150 mm) for equipment.

4. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

2.2 PIPING IDENTIFICATION DEVICES

A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

1. Colors: Comply with ASME A13.1, unless otherwise indicated.
2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
3. Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Full-band pipe markers extending 360 degrees around pipe at each location.
4. Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

C. Shaped Pipe Markers: Preformed semirigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.

D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.

E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils (0.08 mm) thick with pressure-sensitive, permanent-type, self-adhesive back.

1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): 3/4 inch (19 mm) minimum.
2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches (150 mm) or Larger: 1-1/2 inches (38 mm) minimum.

2.3 DUCT IDENTIFICATION DEVICES

A. Duct Markers: Engraved, color-coded laminated plastic. Include direction and quantity of airflow and duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers, with numbering scheme [approved by Architect] <Insert other>. Provide 5/32-inch (4-mm) hole for fastener.
   1. Material: 3/32-inch- (2.4-mm-) thick laminated plastic with 2 black surfaces and white inner layer.
   2. Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook.

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Divisions. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:
   1. Pumps, compressors, chillers, condensers, and similar motor-driven units.
   2. Heat exchangers, coils, evaporators, and similar equipment.
   3. Fans, blowers, primary balancing dampers, and mixing boxes.
   4. Packaged HVAC central-station and zone-type units.

B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.

   1. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
   2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
   3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:

      a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
      b. Fire department hose valves and hose stations.
      c. Meters, gages, thermometers, and similar units.
      d. Pumps, compressors, chillers, condensers, and similar motor-driven units.

e. Heat exchangers, coils, evaporators, and similar equipment.
f. Fans, blowers, primary balancing dampers, and mixing boxes.
g. Packaged HVAC central-station and zone-type units.
h. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

C. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.

1. Identify mechanical equipment with equipment markers in the following color codes:

a. Green: For cooling equipment and components.
b. Yellow: For heating equipment and components.
c. Orange: For combination cooling and heating equipment and components.

2. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
3. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
4. Include signs for the following general categories of equipment:

a. Main control and operating valves, including safety devices.
b. Pumps, compressors, chillers, condensers, and similar motor-driven units.
c. Heat exchangers, coils, evaporators, and similar equipment.
d. Fans, blowers, primary balancing dampers, and mixing boxes.
e. Packaged HVAC central-station and zone-type units.
f. Tanks and pressure vessels.
g. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

D. Install access panel markers with screws on equipment access panels.

3.3 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

1. Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Pretensioned pipe markers. Use size to ensure a tight fit.
2. Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches (38 mm) wide, lapped at least 3 inches (75 mm) at both ends of pipe marker, and covering full circumference of pipe.

B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

3.4 DUCT IDENTIFICATION

A. Install duct markers with permanent adhesive on air ducts in the following color codes:

1. Green: For cold-air supply ducts.
2. Blue: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
3. ASME A13.1 Colors and Designs: For hazardous material exhaust.
4. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

B. Locate markers near points where ducts enter into concealed spaces and at maximum intervals of 50 feet (15 m) in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:

1. Valve-Tag Size and Shape:

   a. Cold Water: 1-1/2 inches (38 mm), round.
   b. Hot Water: 1-1/2 inches (38 mm), round.
   c. Fire Protection: 2 inches (50 mm), round.

2. Valve-Tag Color:

   a. Cold Water: Green.
   b. Hot Water: Yellow.
   c. Fire Protection: Red.

3. Letter Color:

   a. Cold Water: White.
   b. Hot Water: White.
   c. Fire Protection: White.

3.6 VALVE-SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

3.7 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

CLEANING

B. Clean faces of mechanical identification devices and glass frames of valve schedules.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Backdraft dampers.
2. Manual-volume dampers.
3. Fire dampers.
4. Turning vanes.
5. Duct-mounted access doors and panels.
6. Flexible ducts.
7. Flexible connectors.
8. Duct accessory hardware.

1.2 SUBMITTALS

A. Product Data: For the following:

1. Backdraft dampers.
2. Manual-volume dampers.
3. Fire dampers.
4. Duct-mounted access doors and panels.
5. Flexible ducts.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, location, and size of each field connection. Detail the following:

1. Special fittings and manual- and automatic-volume-damper installations.
2. Fire-damper installations, including sleeves and duct-mounted access doors and panels.

C. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA standards:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.

C. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT DAMPERS

A. Description: Suitable for horizontal or vertical installations.

B. Frame: 0.052-inch- (1.3-mm-) thick, galvanized, sheet steel, with welded corners and mounting flange.

C. Blades: 0.025-inch- (0.6-mm-) thick, roll-formed aluminum.

D. Blade Seals: Vinyl.

E. Blade Axles: Galvanized steel.

F. Tie Bars and Brackets: Galvanized steel.

G. Return Spring: Adjustable tension.

2.3 MANUAL-VOLUME DAMPERS

A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 0.064 inch (1.62 mm) thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- (1.62-mm-) thick, galvanized, sheet steel.
3. Blade Axles: Galvanized steel.

4. Tie Bars and Brackets: Galvanized steel.

C. Jackshaft: 1-inch- (25-mm-) diameter, galvanized steel pipe rotating within a pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper of a multiple-damper assembly.

D. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.4 FIRE DAMPERS

A. General: Labeled to UL 555.

B. Fire Rating: One and one-half hours.

C. Fire Rating: One and one-half hours.

D. Frame: SMACNA Type B with blades out of airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.

E. Mounting Sleeve: Factory- or field-installed galvanized, sheet steel.

1. Minimum Thickness: 0.052 inch (1.3 mm) or 0.138 inch (3.5 mm) thick as indicated, and length to suit application.
2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized, sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized steel blade connectors.

H. Horizontal Dampers: Include a blade lock and stainless-steel negator closure spring.

I. Fusible Link: Replaceable, 165 deg F (74 deg C) rated as indicated.

2.5 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.6 DUCT-MOUNTED ACCESS DOORS AND PANELS

A. General: Fabricate doors and panels airtight and suitable for duct pressure class.

B. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.

C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

2.7 FLEXIBLE CONNECTORS

A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

C. Extra-Wide Metal-Edged Connectors: Factory fabricated with a strip of fabric 5-3/4 inches (146 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

D. Transverse Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 4-3/8-inch- (111-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

E. Conventional, Indoor System Flexible Connector Fabric: Glass fabric double coated with polychloroprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp, and 360 lbf/inch (63 N/mm) in the filling.

F. Conventional, Outdoor System Flexible Connector Fabric: Glass fabric double coated with a synthetic-rubber, weatherproof coating resistant to the sun's ultraviolet rays and ozone environment.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp, and 440 lbf/inch (77 N/mm) in the filling.

2.8 FLEXIBLE DUCTS

A. General: Comply with UL 181, Class 1.

B. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch- (38-mm-) thick, glass-fiber insulation around a continuous inner liner.

1. Reinforcement: Steel-wire helix encapsulated in inner liner.

2. Outer Jacket: Polyethylene film.
3. Inner Liner: Polyethylene film.

C. Pressure Rating: 6-inch wg (1500 Pa) positive, 1/2-inch wg (125 Pa) negative.

2.9 ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.

B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch (6-mm), zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches (75 to 450 mm) to suit duct size.

D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and NAIMA's "Fibrous Glass Duct Construction Standards" for fibrous-glass ducts.

B. Install volume dampers in lined duct; avoid damage to and erosion of duct liner.

C. Provide test holes at fan inlet and outlet and elsewhere as indicated.

D. Install fire and smoke dampers according to manufacturer's UL-approved written instructions.

1. Install fusible links in fire dampers.

E. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from volume dampers, fire dampers, turning vanes, and equipment.

1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.
2. Install access panels on side of duct where adequate clearance is available.

F. Label access doors according to Division "Mechanical Identification."

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire dampers for proper action.

C. Final positioning of manual-volume dampers is specified in Section "Testing, Adjusting, and Balancing."

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions.

1.2 SUMMARY

A. This Section includes rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating, and air-conditioning systems in pressure classes from minus 2- to plus 10-inch wg

1.3 DEFINITIONS

A. Thermal Conductivity and Apparent Thermal Conductivity (k-Value): As defined in ASTM C 168. In this Section, these values are the result of the formula Btu x in./h x sq. ft. x deg F or W/m x K at the temperature differences specified. Values are expressed as Btu or W.

1.4 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select and size air-moving and -distribution equipment and other components of air system. Changes to layout or configuration of duct system must be specifically approved in writing by Architect.

1.5 SUBMITTALS

A. Product Data: For duct liner and sealing materials.

B. Shop Drawings: Show details of the following:

1. Duct layout indicating pressure classifications and sizes on plans.

2. Fittings.

3. Penetrations through fire-rated and other partitions.

4. Coordination with other trades and including but not limited to: structural members, electrical lights and conduits, plumbing lines, & fire sprinkler lines.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling- and wall-mounted access doors and panels required to provide access to dampers and other operating devices.

2. Coordination with ceiling-mounted items, including lighting fixtures, diffusers, grilles, speakers, sprinkler heads, access panels, and special moldings.

D. Duct Construction Standards: Provide a copy of the duct construction standards to be used for each pressure classification in this project. Duct Construction Standards must comply with the latest edition of SMACNA “HVAC Duct Construction Standards – Metal and Flexible.”

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

F. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.

1.6 QUALITY ASSURANCE

A. Welding Standards: Qualify welding procedures and welding personnel to perform welding processes for this Project according to AWS D1.1, "Structural Welding Code--Steel," for hangers and supports; AWS D1.2, "Structural Welding Code--Aluminum," for aluminum supporting members; and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," unless otherwise indicated.

C. Comply with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems," unless otherwise indicated.

D. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Chapter 3, "Duct System," for range hood ducts, unless otherwise indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealant and firestopping materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle sealant and firestopping materials according to manufacturer's written recommendations.

C. Deliver and store stainless-steel sheets with mill-applied adhesive protective paper maintained through fabrication and installation

D. Deliver and store all ductwork with protective material until installation. Any material left exposed to moisture and/or particulates shall be removed and replaced.

E. Any installed ductwork or piping system left temporarily incomplete shall be covered with protective material until final connections can be installed.

F. All ductwork and/or liner insulation to be wrapped with protective material until installation. Any ductwork or insulation left exposed to the environment or contaminating particulate matter shall be replaced at the contractor’s expense.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, exposed matte finish.

C. Stainless Steel: ASTM A 480/A 480M, Type 316, sheet form with No. 4 finish for surfaces of ducts exposed to view; and Type 304, sheet form with No. 1 finish for concealed ducts.

D. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

1. Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant, formulated with a minimum of 75 percent solids.

2. Flanged Joint Mastics: One-part, acid-curing, silicone, elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.3 HANGERS AND SUPPORTS

A. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.

1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rod or galvanized rods with threads painted after installation.

2. Straps and Rod Sizes: Comply with latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for sheet steel width and thickness and for steel rod diameters.

B. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

C. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

1. Supports for Galvanized-Steel Ducts: Galvanized steel shapes and plates.

2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.

3. Supports for Aluminum Ducts: Aluminum support materials, unless materials are electrolytically separated from ductwork.

2.4 RECTANGULAR DUCT FABRICATION

A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to the latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.

2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

B. Fabricate range hood exhaust ducts with 0.0598-inch- thick, galvanized sheet for concealed ducts and 0.0500-inch- thick stainless steel for exposed ducts. Weld and flange seams and joints. Comply with NFPA 96.

C. Fabricate dishwasher hood exhaust ducts with 0.0500-inch- thick stainless steel. Weld and flange seams and joints.

D. Static-Pressure Classifications: Unless otherwise indicated, construct ducts to the following:

1. Supply Ducts between AHU and Air Terminal Units: 3-inch wg.

2. Supply Ducts after air terminal units and on constant volume supply equipment: 1-inch wg (250 Pa), positive pressure

3. Return Ducts: 1-inch wg ,negative pressure.

4. Exhaust Ducts: 1-inch wg negative pressure.

E. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of unbraced panel area, unless ducts are lined.

2.5 ROUND FABRICATION

A. Round Ducts: Fabricate spiral seam supply and return ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Snap Lock Longitudinal seam ductwork will not be allowed. Adjustable elbows will not be allowed.

B. Spiral seam round or oval duct may be substituted for rectangular duct at the contractors option. Spiral seam ductwork sizing must result in the same or less pressure drop than the rectangular duct indicated on the plans.

2.6 DUCT STORGE

A. All duct must have end capped with plastic covers on both ends from end of fabrication to duct installation. If this is not provided at the field, vacuum ducts before final acceptance to remove dust and debris.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION, GENERAL

A. Duct installation requirements are specified in other Division Sections. Drawings indicate general arrangement of ducts, fittings, and accessories.

B. Construct and install each duct system for the specific duct pressure classification indicated.

C. Install round ducts in lengths not less than 10 feet (3 m), unless interrupted by fittings.

D. Install ducts with fewest possible joints.

E. Install fabricated fittings for changes in directions, changes in size and shape, and connections.

F. Install couplings tight to duct wall surface with a minimum of projections into duct.

G. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.

H. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

I. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

J. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.

K. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

L. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches (38 mm).

N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and firestopping sealant. Fire and smoke dampers are specified in Division Section "Duct Accessories." Firestopping materials and installation methods are specified in other Divisions

3.2 SEAM AND JOINT SEALING

A. General: Seal duct seams and joints according to the duct pressure class indicated and as described in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." All duct to be sealed to SMACNA seal class A which requires sealing all transverse joints, longitudinal seams and duct wall penetrations regardless of pressure classification.

B. Seal externally insulated ducts before insulation installation.

C. All ducts shall be inspected after sealing is complete and prior to insulation installation. Provide the engineer with a minimum 7 days notice prior to beginning duct insulation.

3.3 HANGING AND SUPPORTING

A. Install rigid round and rectangular metal duct with support systems indicated in the latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.

C. Support vertical ducts at a maximum interval of 16 feet and at each floor.

D. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

3.4 CONNECTIONS

A. Connect equipment with flexible connectors according to Section "Duct Accessories."

B. For branch, outlet and inlet, and terminal unit connections, comply with the latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

3.5 DUCT APPLICATION

A. Service: Round and rectangular, supply/return/outside -air ducts, concealed.

1. Sheet-metal with wrap insulation

B. Service: Round and rectangular, supply/return/outside -air ducts, exposed and in mechanical rooms.

1. Sheet-metal double wall with lined insulation in-between.
2. Inner sheet-metal duct shall be perforated in areas with acoustical requirements, ref. plans.

C.

3.6 FIELD QUALITY CONTROL

A. Disassemble, reassemble, and seal segments of systems as required to accommodate leakage testing and as required for compliance with test requirements.

B. 25% of the duct installed after the air handling units and (prior to the air terminal units, when applicable) shall be tested in the presence of the Architect, at static pressures equal to maximum design pressure of system or section being tested. The sections of duct to be tested shall be chosen by the architect or engineer after installation of the duct. If pressure classifications are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.

C. Leakage Test: Perform tests according to SMACNA's "HVAC Air Duct Leakage Test Manual."

D. Maximum Allowable Leakage: Comply with requirements for Leakage Classification 3 for round, Leakage Classification 12 for rectangular ducts in pressure classifications less than and equal to 2-inch wg (both positive and negative pressures), and Leakage Classification 6 for pressure classifications from 2- to 10-inch wg.

E. Remake leaking joints and retest until leakage is less than maximum allowable.

3.7 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect the system.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install supply air branch duct runouts to diffusers as described in Contract Documents.

1.2 REFERENCES

A. Reference Standards:
   1. National Fire Protection Association / American National Standards Institute:
      a. NFPA 90A: 'Standard for the Installation of Air-Conditioning and Ventilating Systems' (2012 Edition).
   2. Underwriters Laboratories:
      a. UL 181, 'Factory-Made Ducts and Air Connectors' (10th Edition).
      b. UL 181B, 'Closure Systems for Use With Flexible Air Ducts and Air Connectors' (3rd Edition).

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:
   1. Manufacturer Contact List:
      a. Anco Products Inc,
      b. Thermaflex by Flexible Technologies
      c. Flexmaster USA Inc, Houston, TX

B. Materials:
   1. Ducts:
      a. Formable, flexible, circular duct which shall retain its cross-section, shape, rigidity, and shall not restrict airflow after bending.
      b. Insulation:
         1) Nominal 1-1/2 inches (38 mm), 3/4 lb per cu ft (12 kg per cu m) density fiberglass insulation with air-tight, polyethylene or polyester core, sheathed in seamless vapor barrier jacket factory installed over flexible assembly.
      c. Assembly, including insulation and vapor barrier, shall meet Class I requirement of NFPA 90A and be UL 181 rated, with flame spread of 25 or less and smoke developed rating of 50 or under.
      d. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
         1) ANCO-FLEX 4625 by Anco Products.
         2) M-KC by Thermaflex by Flexible Technologies.
         3) Type 4m Insulated by Flexmaster.
   2. Cinch Bands: Nylon, 3/8 inch removable and reusable type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct in fully extended condition free of sags and kinks, using 60 inch maximum lengths.

B. Make duct connections by coating exterior of duct collar for 3 inches with duct sealer and securing duct in place over sheet metal collar with specified cinch bands.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes centrifugal fans and vent sets.

1.2 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base air ratings on actual site elevations.

B. Operating Limits: Classify according to AMCA standards.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each unit scheduled and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material gages and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For centrifugal fans to include in maintenance manuals specified in specifications.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.6 COORDINATION

A. Coordinate size and location of structural support members and/or shaft locations.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in these documents.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cook, Loren Company.
2. Greenheck.

2.2 HOUSINGS

A. Roof Mounted Centrifugal Exhaust Fan.
1. The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have continuously welded curb cap corners for maximum leak protection. The discharge baffle shall have a rolled bead for added strength. An integral conduit chase shall be provided through the curb cap and into the motor compartment to facilitate wiring connections. Bearings and drives shall be mounted on a minimum 14 gauge steel power assembly, isolated from the unit structure with rubber vibration isolators. These components shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. Unit shall bear an engraved aluminum nameplate and shall be shipped in ISTA certified transit tested packaging.

2.3 WHEELS

A. Roof Mounted Centrifugal Exhaust Fan

1. Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

2.4 SHAFTS

A. Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.

B. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.

C. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

2.5 BEARINGS

A. Prelubricated and Sealed Shaft Bearings: Self-aligning, pillow-block-type ball bearings.

1. Ball-Bearing Rating Life: ABMA 9, L_{50} of 200,000 hours.
2. Roller-Bearing Rating Life: ABMA 11, L_{50} of 200,000 hours.

2.6 BELT DRIVES

A. Description: Factory mounted, with final alignment and belt adjustment made after installation.

1. Service Factor Based on Fan Motor: 1.5.

B. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.

C. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with motors larger than 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.

D. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.

E. Motor Mount: Adjustable for belt tensioning.

2.7 ACCESSORIES

A. Scroll Access Doors: Shaped to conform to scroll, with quick-opening latches and gaskets.

B. Companion Flanges: Galvanized steel, for duct connections.

C. Scroll Drain Connection: NPS 1 (DN 25) steel pipe coupling welded to low point of fan scroll.

D. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.

E. Spark-Resistant Construction: AMCA 99 (where required).

F. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.

G. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing.

2.8 MOTORS

A. Refer to Section "Motors" for general requirements for factory-installed motors.

B. Motor Construction: NEMA MG 1, general purpose, continuous duty, high efficiency, Design B.

C. Enclosure Type: [Open dripproof] [Totally enclosed, fan cooled].

2.9 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install centrifugal fans level and plumb.

B. Install units with clearances for service and maintenance.

C. Label fans according to requirements specified in Section "Mechanical Identification."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Duct Accessories."

B. Install ducts adjacent to fans to allow service and maintenance.

C. Ground equipment.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Equipment Startup Checks:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Verify lubrication for bearings and other moving parts.

B. Starting Procedures:

1. Energize motor and adjust fan to indicated rpm.
2. Measure and record motor voltage and amperage.

C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Shut unit down and reconnect automatic temperature-control operators.

F. Refer to Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.

G. Replace fan and motor pulleys as required to achieve design airflow.

H. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

3.5 CLEANING

A. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.

B. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain centrifugal fans.

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
2. Review data in maintenance manuals. Refer to specifications Section "Closeout Procedures."
3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

1.2 DEFINITIONS

A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.

C. Register: A combination grille and damper assembly over an air opening.

1.3 SUBMITTALS

A. Product Data: For each model indicated, include the following:

1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.
4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

B. Coordination Drawings: Reflected ceiling plans and wall elevations drawn to scale to show locations and coordination of diffusers, registers, and grilles with other items installed in ceilings and walls.

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Install diffusers, registers, and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Diffusers, registers, and grilles are scheduled on Drawings.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Titus.
2. Price
3. Carnes
4. Krueger

2.2 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

B. Noise
1. The noise spectrum of the supply units shall be no higher than 5 db less than N.C.-35 as defined in the latest issue of ASHRAE Guide
2. Units causing excessive air movement, drafts or objectionable noise shall be replaced at no cost to the Owner

EXECUTION

2.3 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

2.4 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. . Coordinate device locations with ceiling grid, sprinklers, and lights. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

2.5 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

2.6 CLEANING

A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Specification Sections and other Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The following Summary of Work is intended as an aid to achieve an understanding of the various elements of work included in the project, as is not intended to be all-inclusive. Detailed descriptions of work and requirements are given in drawings and specifications.

B. General Scope of Work:

1. Providing new panels, feeders, conduits, disconnect, and new light fixtures.

1.4 COORDINATION

A. All electrical work shall be done under sub-contract to a General Contractor. Electrical Contractor shall coordinate all work through General Contractor, even in areas where only electrical work is to take place.

B. Work shall take place with minimal disruption to Owner’s operations in areas surrounding the new building.

C. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

D. Fully coordinate with mechanical contractor for providing power to mechanical equipment.

1.5 UTILITIES

1. Coordinate with power company and provide conduit, and trenching from transformer to power source. Coordinate with water, telephone, cable and gas utilities to locate all utilities prior to digging in any area.
2. Obtain any approvals required from utilities to relocate utilities.
3. Cost of relocating or bypassing utilities indicated on drawings shall be included in Base Bid.

1.6 CONTRACTOR USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use by the public.
2. Driveways and Entrances: Keep driveways and entrances serving the premises, clear and available to the Owner, the Owner's employees, and emergency vehicles at all time. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Site Safety: Take every precaution to ensure the site does not present a threat to the safety of occupants and/or workers. Minimal safety requirements include, but are not limited to the following:

1. Temporary fencing around construction areas.
2. Yellow caution tape and construction barricades along open trenches during the day. Trenches shall be covered at night and warning lights provided on construction barricades.
3. Temporary fencing around equipment while site work is in progress.

1.7 SUBMITTALS

1. To extradite the submittal process more efficiently, do not piece-meal the submittals. Submit entire electrical in a bound enclosure. This will eliminate delays in the submittal process. Unbound submittals shall be returned without review. Submit 10 copies minimum.

END OF SECTION

PART 1 - **GENERAL**

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

A. This Section applies to the furnishing and installing of electrical materials as specified here and in all other Division 16 Sections,

PART 2 - PRODUCTS

2.1 EQUIPMENT WITHSTAND RATINGS

A. Electrical equipment, circuit protective devices, bussing, and switches shall be rated to interrupt or withstand short circuit faults greater than the available fault current.

B. Refer to Section Short Circuit and Coordination Study.

2.2 WIRE AND CABLE

A. General-

1. Wire and cable for feeder and branch circuits shall conform to the requirements of the current edition of the National Electrical Code, and shall meet applicable ASTM specifications. Conductors shall be soft drawn, annealed, 98 percent conductivity copper. Wire and cable shall be new, shall have size, type of insulation, voltage rating and manufacturer's name permanently marked on the outer covering at regular intervals. Conductors No. 6 AWG and smaller shall be color coded. Colors for each phase and neutral shall be consistent throughout the system.

B. Over 600 volt insulation-

1. Anaconda "Unishield" MV90EPR medium voltage solid dielectric shielded cable consisting of stranded conductors, extruded semiconductor strand shield sheath, ethylene propylene rubber (EPR) insulation, and insulation shield and jacket composed of 6 longitudinal corrugated copper drain wires embedded in an extruded semi-conducting chlorinated polyethylene (CPE) jacket, conforming to IPCEA-NEMA S-68-516.
   a. Rated 15kv, 90C, 220 mil insulation thickness.
   b. Insulation thickness for 133% (underground systems) shall comply with Table 310-64 of current NEC.
2. High voltage splices and terminations-
   a. Provide kits rated at the cable voltage with shielding and stress cone materials assembled by the manufacturer for individual or for groups of splices and terminations. Kits shall consist of materials designed for the cables and shall be suitable for the prevailing environmental conditions. Kits shall include detail drawings and printed instructions indicating cable type, voltage rating, manufacturer's name and catalog numbers.

   b. 600 amp primary elbow terminator bushing combination shall be load-make type with 600 ampere continuous current ratings at 14.4 kv line-to-line voltage capable of safely closing in on a 20,000 ampere symmetrical fault current. The terminator shall provide a completely water tight cable seal, and shall be

furnished complete with molded rubber semi-conductive outer shield, double connection points for grounding of neutral wires to the outer shield, and permanent molded identification on each elbow including a clearly visible indication that it is of the load-break type. The terminator shall be sized properly for the type of cable on which it is to be used. All elbow terminator/bushings combination for installation on switches and transformers shall be of the same manufacturer. Bolt "T" type connectors only will be acceptable. 1) Based on Type JT2B terminator and Type JLB2B20 bushing or approved equal combination.

c. Provide primary bushing protective caps to insulate, electrically shield, and mechanically seal each bushing. It shall be rated 8.3 kv phase-to-ground and provision in semi-conductive outer jacket for solid attachment of ground lead. A stainless steel eye shall be provided for hotstick operation.
1) 600 amp based on Blackburn ABOC or approved equal.

d. RTE Visabreak terminals are not an approved manufacturer.

C. 600 volt insulation - Provide conductors with insulation rated for 600 volts unless specified or indicated otherwise. System design is based on the following U.S. products:

1. NEC Type THW, XHHW, THWN or THHN solid for Number 10 AWG or smaller.
2. NEC Type THW, XHHW, THWN or THHN stranded for Number 8 and larger.
3. Plenum Cable - Provide UL listed cables, complying with the requirements of the National Electrical Code exceptions 725-2 (B), 760-4 (D), and 800-3 (D), insulated with a UL classified fluoropolymer material for all cable applications within plenums unless enclosed in conduit. Any cables not enclosed in conduits in such plenums shall have insulation classified as low smoke producing and very low flame spread, such as Teflon FEP or Halon ECTFE, and be UL listed for the specific application.
4. Type CP cathodic protection cable-high molecular weight (HMW) polyethylene (PE) insulation, IPCEA-NEMA S-61-402.
5. NEC Type MC - Factory assembled armored cable consisting of one or more insulated conductors, and bare ground wire, with suitable filler and a binder applied over the twisted conductors consisting of a compound filled fabric tape, enclosed with a covering of interlocking metal tape, or an impervious close fitting corrugated tube.
   a. Conductors shall be copper, NEC Type XHHW with 90 C. 600 volt rated crosslinked polyethylene insulation.

D. Acceptable Manufacturers for Wire and Cable - Alcan, American Insulated Wire, Cablec, Capital,

Diamond, General Cable, Larribee, Nehring, Okonite, Paranite, Pirelli, Royal, Senator.

E. Acceptable Manufacturers for 15 KV Cable - Cablec, Okonite, Pirelli.

F. Acceptable Manufacturers for Type MC Cable; Alflex, AFC, America Metal Moulding.

G. Acceptable Manufacturers for Connectors-Appleton, Blackburn, Bridgeport, Buchanan,

Burndy,

Ideal, Killark, llsco, 3M, O.Z., Penn Union, Thomas & Betts.

2.03 CABLE ACCESSORIES, SPLICES AND TERMINATIONS

A. General-

1. All low and medium and high voltage cable accessories shall be of the heat shrinkable type.

They shall be of one manufacture to assure consistency in application, installation

procedures and training of installers. They shall be of Raychem manufacture or approved equal by 3M and shall be acceptable to the cable manufacturer.

B. 600V Motor Connections-

1. Low voltage motor connections shall be insulated and sealed with heat shrinkable kits, factory engineered for the application. Motor connection kits shall contain flame-retarded, heavy wall, heat shrinkable insulation components, barrier strip to exclude sealant material from the bolt area, and heat activated sealant material to prevent the ingress of moisture and contamination. Kits shall meet the requirements of ANSI-C119.1-1986.

C. 600V Inline Splices-

1. Low voltage cable splices shall be insulated and sealed with heat shrinkable flame-retarded heavy wall polyolefin sleeves. Splicing sleeves shall be designed to provide an insulation thickness, over the connector, to meet or exceed the National Electrical Code requirements for the wire size and type being spliced. Splicing sleeves shall also meet the applicable requirements of UL486D-1984 and ANSI-C119.1-1986.

2.04 RACEWAYS

A. Metallic conduit and ANSI C80.4 fittings shall be incorporated into the Electrical Work in accordance with the applicable articles of the National Electrical Code.

B. ARC - Aluminum rigid conduit, threaded and coupled, ANSI C-80.5

C. GRC - Galvanized rigid conduit, threaded and coupled steel, ANSI C80.1, UL-6, protected by an overall zinc coating to the inside and outside surfaces of the metal. Coating may be applied by the hot-dip metalizing or sherardizing process.

D. IMC - Intermediate metal conduit, threaded and coupled steel, manufactured in accordance with UL 1242, hot-dip galvanized, installed in accordance with UL general information card DYBY and NEC Article 345, with threaded joints.

E. EMT - Electrical metallic tubing, "thin wall" zinc coated steel, enameled interior, ANSI C80.3, UL-797, assembled using concrete tight and rain tight gland-ring compression threaded type fittings except where alternate type fittings are specifically allowable.

F. Flex - Flexible steel, UL-1, conduit shall be constructed from interlocking single strip flexible steel tubing, galvanized orsherardized. Connectors shall be galvanized, malleable iron squeeze type, or Tomic twist-in type.

G. Liquid-tight flexible metallic raceway shall be similar to standard flexible steel conduit except encased in liquid tight neoprene outer jacket.

H. PVC - Polyvinyl chloride Schedule 40, NEMA TC2, UL 651, with solvent welded joints.

I. EB (plastic) - Encased Burial - High impact polyvinyl chloride (PVC) or acrylonitrile butadiene styrene (ABS) Type 1, tubing and fittings designed for cement encasement, NEMA TC1, with solvent welded joints.

J. SMR - Surface Metal Raceway - An assembly consisting of base and cover sections, fittings and boxes, constructed of corrosion resistant coated steel with an interior finish to avoid abrasion of electrical conductors, conforming to UL o. -1977 and F.S. W-C-582.

Cable Tray-

1. Refer to Section , A. and C. for cable tray specifications.

L. Application-

1. Provide electrical metallic tubing (EMT) within structure, except as specified otherwise.
2. EMT connectors - Provide gland ring compression threaded fittings, except-
   a. Concrete tight double set screw type connectors are acceptable in 2**1/2**-inch and larger sizes in dry locations only.
3. Rigid steel conduit (GRC) shall be used in the following locations-
   a. High voltage duct bank elbows and risers.
   b. At or below grade.
   c. In locations where electrical metallic tubing is not permitted and other raceway is not required.
   d. Hazardous areas as defined by NEC.
   e. Where exposed to physical damage, excessive moisture, rain, etc.
   f. At drop connections to motors.
4. Provide flexible conduit for transformer connections, and at equipment requiring adjustments or removal for service, not subject to moisture.
5. Provide liquid-tight flexible conduit for each motor and rotating device for power and control, computer room and for other equipment requiring adjustments or removal for service in mechanical rooms or where subject to moisture or weather.
6. Non-metallic conduit (and grounding conductor) with rigid steel riser stub-ups maybe used for slabs on grade.
7. Conduit and fittings shall be UL listed for the application and location of their intended uses.

M. Acceptable Manufacturers - for GRC, IMC, and EMT - Allied, Century, Triangle, Western, Wheatland.

N. Acceptable Manufacturers for GRC, IMC, and EMT Fittings - Adalet, Appleton, Bridgeport, Electroline, Midwest, Neer, O.Z. Gedney, Raco, Steel City.

O. Acceptable Manufacturers for flex and liquid-tight flex - American Flex, Alflex, Anamet, Anaconda, Coleman, Electri-Flex, International.

P. Acceptable Manufacturers for flex and liguid-tight flex fittings - Adalet, Appleton, Bridgeport, Berger, Efcor, Electroline, Midwest, Neer, O.Z. Gedney, Raco, Steel City.

Q. Acceptable Manufacturers for PVC and PVC fittings - Cantex, Carlon Certainteed, National, Sedco, Midwest.

2.05 CABLE FIRESTOPS

A. Seal cable (including telecom cables) penetrations of fire-rated floors, ceilings, and walls with a fire-rated closure in compliance with NEC 300-21 and UL 1479. Closures shall be rated as per ASTM-E-119 three-hour fire rating and hose test and shall consist of grouted-in metal frame sized for applicable fill per NEC, and sealing block assemblies of elastomeric material sized to fit the cables or conduits entering the fire barrier. The elastomeric material shall expand during fire to seal any voids left by burning cable insulation,

B. Install closures in accordance with manufacturer's recommendations.

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1 Acceptable Manufacturers - Walker, Wiremold, Airey-Thompson, Tehalit.

2.06 FLASHINGS

A. Provide weatherproof flashings for openings through the roof related to electrical systems.

B. Flashings for conduits shall be constructed from 20 gage galvanized steel sheets, with a base extending 10-inches in each direction beyond the exterior surface of the opening to be flashed.

C. Flashings shall be constructed to terminate not less than 12-inches above the roof with suitable counterflashing constructed from the same material as the flashing.

D. Furnish flashings for curbs related to electrical system. Furnish and install counterflashing at each curb.

2.07 HANGERS AND SUPPORTS

A. Refer to Vibration Isolation Section for specific instruction on spring loaded hangers and isolation in connection with resiliently mounted equipment, which shall be followed in detail as far as method and types of isolation are concerned.

B. Conduits - Support securely from the structure with rigid steel supports. Provide necessary channels, hanger rods, bolts, nuts, locknuts, accessories and devices to provide a complete structural system. The system shall allow free expansion and contraction.

C. Panelboards, Disconnects, Starters, Cabinets, Pull and Junction Boxes, etc. Provide channel supports and miscellaneous steel angles to rigidly support equipment from the structure where required by special conditions and where vertical and/or horizontal support is required other than that provided in the structure.

D. Structural support systems shall be specifically designated as suitable for electrical installations. Bases, dimensions and sizes are to be as required for application, job conditions, loads imposed and manufacturer's recommendations.

E. Channels - Provide continuous slotted channel, #12 gage steel (MINIMUM). Fasten conduits to channels with pipe channel straps.

F. Hanger Rods - Provide steel rods with continuous, free running threads.

G. Straps, Pipe and Conduit Hangers, Inserts, Clamps, Accessories and Devices Provide malleable iron or formed steel, as applicable.

H. Flexible cable, strap or wire hangers and fasteners will not be accepted.

I. Steel and malleable iron shall be zinc chromate electrogalvanized.

J. Attachments to Structure - Fastenings to wood shall be by wood screws or screw type nails. Fastenings to hollow masonry units shall be by toggle bolts. Fastenings to concrete or brick shall be by preset inserts or expansion bolts. Fastenings to steel shall be by machine screws, bolts (with flat washers and lockwashers), welded threaded studs or beam clamps designed for the application. Wood plugs and gun fired power driven fasteners will not be accepted.

K. Fasten single runs of conduit directly to the structure or hang on rod hangers with one or two hole pipe straps, "U" bolts, lay-in pipe hangers, conduit and pipe hangers, beam clamps and angle clamps as appropriate.

L. Fasten multiple runs of conduit directly to the structure using continuous channel inserts or continuous surface channels. Trapeze hangers utilizing channels and rod hangers may also be used.

M. Conduit shall be securely fastened within three feet of each outlet or junction box, fitting, cabinet or panelboard. Conduit shall be fastened at intervals not to exceed 10 feet.

N. Provide riser clamps at floor lines for vertical runs of conduit.

O. Conduits and Raceways with Expansion Joints - Install supports to allow equally distributed expansion and contraction. Use guides, saddles, "U" bolts and/or anchors designated for this application.

P. Cables and Wires in Manholes, Cable Chambers, Cable Chases and Other Locations - Provide hangers, racks, cable cleats and supports designated for the application to insure a neat and secure installation.

Q. Structural support systems, channels, hanger rods, bolts, nuts and accessory items shall be as manufactured by Unistrut or approved equal.

R. All supports shall be directly connected to basic structural elements of the building or sitework. Electrical support systems shall be independent of other systems (HVAC, plumbing, suspended ceilings, raised floors, etc.). Support systems may be shared with similar wireway and conduit systems (fire alarm, security, MATV, etc.).

2.8 IDENTIFICATION

A. Bundle all associated conductors and/or cables exiting from conduit or cable with ties, similar to the T & B Ty-Wrap, at the beginning and end of the bundled group. Provide identification by using ties similar to the T & B Ty-Wrap identification tie.

B. Identify individual conductors at their termination by wrap-around type of identification similar to T & B conductor markers.

C. Identify all terminal blocks and terminals in the switchgear and control cabinets similar to the conductor groups mentioned above.

D. The identification of conductors, cables and conduit shall conform to that set forth in their respective schedules.

2.9 GROUND EQUIPMENT

A. Rods -10 feet long, 3/4-inch diameter copper weld rods.

B. Conductor - Sized no smaller than the following-

1. The size noted on the drawings or otherwise scheduled.
2. The size of the phase conductors in the feeder or branch circuit.
3. The sizes required by Article 250 of the National Electrical Code.

C. Exothermic Grounding Connectors - Provide Cadweld exothermic welding system as manufactured ERICO Products Inc. Only Cadweld Exolon low smoke, low emission welding system shall be used in enclosed areas of the building.

D. Compression Grounding Connectors - Provide Hyground compression system as manufactured by Burndy. Each connector shall have the die index number embossed on application.

E. Grounding connectors shall meet the test requirements of IEEE Standard 837-1984.

F. Provide precast handholes with concrete or cast iron covers as scheduled, to allow inspection of all connections below grade.

G. All ground conductors shall be copper, and unless specifically noted otherwise, shall be provided with Type THW or THWN, 600 volt insulation.

H. Ground busses required for the interconnection of grounding conductors shall be solid copper bars, rigidly supported by metal framework and insulated from the building structure with insulated isolators. Conductors shall be supported independently and rigidly attached to the building structure. Attach conductors to the buss with compression type lugs.

2.10 EXPANSION JOINTS

A. Provide slip type galvanized steel conduit expansion joints wherever structural expansion joints are crossed by conduits embedded in slabs. Install with end barrels flush with concrete on both sides.

2.11 PROTECTIVE COATING FOR METALLIC CONDUIT

A. Cold applied coating in tape form having a minimum thickness of 35 mils and a minimum dielectric strength of 12 kv, conforming to the applicable requirements of ASTM-D-5, ASTM-D-1000, ASTM-G-8, and ASTM-D-1737. Metallic conduit and fittings below grade shall be spiral wrapped with a minimum of l/4-inch overlap. Conduit preparation shall be in accordance with coating manufacturer's recommendations.

B. Scotch rap 53.

2.12 VERTICAL SUPPORTS

A. On buildings exceeding 50 feet in height, provide cable support boxes thru which riser conductors shall pass. Support each riser within the box with a multiple conductor wedge grip type of cable support. The maximum vertical distance between cable supports for the various size conductors shall not exceed the distances allowed by the National Electrical Code.

2.13 WIREWAYS, PULL AND JUNCTION BOXES

A. Provide wireways, junction and pull boxes indicated and at locations required by the National Electrical Code, and at those locations required to facilitate the pulling of wire, fabricated in accordance with NEMA and National Electrical Code requirements with respect to material, gages, dimensions and methods of fastening. Wireways, junction and pull boxes shall bear the UL label and shall be listed for the application and location of their intended use. Units shall be finished in standard gray enamel, sides and backs spot welded in position, and removable screw cover.

B. Construct wireway and accessories in accordance with UL 870, with hinged, removable, sealable covers, arranged for lay-in conductor installation. Connectors shall be slip-in arrangement with captive mounting screws. Arrange hangers in a "J" configuration to allow conductor lay-in from one side.

C. Interior boxes shall be stamped or fabricated galvanized steel.

D. Exterior boxes not totally protected from exposure to driving rain or from excessive moisture shall be hot-dip galvanized cast iron, complete with threaded hubs, bolted weatherproof covers, and rubber or neoprene gaskets.

E. Grade level exterior boxes shall be cast iron with solid covers secured with rubber gaskets and bronze cap screws. Conduit connections shall be drilled and tapped for threaded connections.

1. Neenah Series R7519.

F. Construct exterior concrete boxes as detailed with solid cast iron covers secured with rubber gaskets and bronze cap screws.

1. Neenah Series R6665.

G. Conduits entering boxes shall be thru tight-fitting bored or punched holes, or threaded hubs, and shall be secured firmly.

H. Covers in finished areas shall have prime coat.

I. The volume of the boxes shall be in accordance with the NEC requirements, but shall be no smaller than 4-inches square in any case.

J. Boxes shall be accessible at job completion. Boxes with covers in finished areas shall be in those physical locations approved by the Architect.

K. Acceptable Manufacturers - Unity, Universal, Circle AW, Hoffman, Neenah.

2.14 OUTLET BOXES

A. Interior boxes - Standard, single or multiple gang stamped galvanized steel boxes, of the proper size to accommodate the device and function for which intended, complete with extension or plaster rings where required. Boxes for mounting of surface lighting fixtures shall be 4-inch octagon boxes, with 3/8-inch no-bolt fixture studs used to securely support fixture. Provide proper covers or device plates.

B. Exterior boxes - Hot-dip galvanized cast iron, complete with threaded hubs, bolted weatherproof covers, and rubber or neoprene gaskets.

C. Concrete boxes - Outlet boxes in concrete slabs shall be two-piece concrete boxes not less than 4-inch nominal size with a minimum depth of 2^{1}/i-inches. If used for lighting fixtures, outlet boxes shall be equipped with fixture stud.

D. Waterproof boxes - Design FD or FS conduit boxes of cast or metal threaded hub type with suitable gasket covers shall be used where waterproof boxes are required.

E. Flush type floor boxes - Fully adjustable (before and after concrete pour), cast iron for slabs on grade, stamped steel for slabs above grade, with surface flush ring finish to match wiring devices and coverplates specified, with waterproof threaded outlets, sized and arranged to receive devices scheduled.

F. Acceptable Manufacturers - Appleton, Adalet, Bowers, Crouse Hinds, Killark, O.A. Gedney, Raco, Red Dot, Steel City.

2.15 TERMINAL CABINETS

2.16 BACKBOARDS

A. Construct backboards from exterior grade Douglas fir plywood 3/4-inch thick, and mount on walls or in cabinets with the bottom of the board 6-inches above the finished floor minimum. Secure to walls with inserts embedded in the wall, and not less than 1/4-inch -20 brass machine bolt, with nut and washers. For telephone backboards, furnish a No. 6 AWG grounding conductor with terminal lug attached to the lower right-hand bolt of the board.

1 Provide an appropriate plug for each special purpose receptacle.

2.17 WIRING DEVICES

A. Install on each and every outlet box, a wiring device and coverplate, as indicated by symbol on the Drawings. Manufacturer's model numbers are not intended to indicate color of devices. Color of devices is designated under "Device Plates".

B. Toggle switches shall be quiet, ac type, specification grade, listed by Underwriters Laboratories, Inc., and meeting the requirements of NEMA Standard WD-1. Back or side screw terminal shall accommodate up to 10 AWG solid or stranded conductors. Contacts shall be rated at 20 amperes, 120/277 volts ac only, single pole, 3-way, 4-way, or key-operated as indicated.

1. Leviton1221.

C. Each pilot light shall be installed as a separate device, using a multi-gang box and switch plate when combined with another device. Lamp holders shall be of the strap type, with flush neon pilot light having red jewel.

1. Leviton 1221-PLR Series.

D. General purpose single and duplex receptacles - Shall be industrial specification grade rated 125 volts, two-pole, three-wire, grounding type with polarized parallel slots, Style S Series, in accordance with Federal Specification W-C-596, and listed by Underwriters Laboratories, Inc., in accordance with NEMA Standard Publication WD-1, paragraph 3.02. Bodies shall be of phenolic compound supported by mounting strap having plaster ears. Contact arrangement shall be such that contact is made on two sides of an inserted blade. Receptacle shall be side-or-back wired with two screws per terminal. The third grounding pole shall be connected to the metal mounting yoke.

1. 20 ampere, NEMA 5-20R, Duplex-Leviton 5362 Series.
2. 20 ampere, NEMA 5-20R, Simplex-Leviton 5361 Series.
3. 20-ampere, 125-volt, 2-pole, 3-wire,isolated ground, straight blade, duplex, NEMA 5-20. a. Leviton IG-5362IG.

E. Ground Fault Circuit Interrupter (GFCI) - Shall be commercial specification grade rated 125 volts, two-pole, three wire, duplex, dual direction test and reset buttons, Class A rated GFCI, trip threshold - 5 mA, +1 mA, trip time - 0.025 sec and shall incorporate self-diagnostic which will not allow device to be reset unless ground fault protection is present. Feed through option not acceptable.

1. 20 ampere NEMA 5-20R, duplex, Leviton 8899.

F. Special-purpose or heavy-duty receptacles - Shall be of the type and of ratings and number of poles indicated or required for the anticipated purpose.

G. Universal hanger outlets - 20-ampere, 125-volt, NEMA 6-20R recessed outlet with

hook. 1. Leviton 5261-CH.

H. Device Plates-

1. Provide one-piece coverplates with rounded edges for outlets and fittings to suit the devices installed. Screws shall have countersunk heads, provided in a color to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices, plaster fillings will not be permitted. Plates shall be installed with an alignment (plumb) tolerance of 1/16-inch. The use of sectional-type device plates will not be permitted. Plates installed in wet locations shall be gasketed. Device plates for telephone and intercommunications outlets shall have a 3/8-inch bushed opening in center. Finish color shall be ivory.
2. Provide smooth zinc finish cast metal or sheet steel plates with ivory color devices in-

a. Finished areas.
b. Unfinished walls.
c. Equipment rooms.

3. Exterior coverplates - Provide Type 302 stainless steel weatherproof plates with spring hinged cover and PVC plate and cover gaskets with ivory color devices.

I. Where flush floor receptacles are required, they shall be coordinated with male plug furnished with equipment served. Service fittings installed in carpeted areas shall include brushed aluminum carpet flanges. Provide nozzles for active flush outlets.

J. Wherever flush floor boxes are required, box depth shall be coordinated with slab thickness. When installation is required after concrete slab is poured, the core boring shall be large enough to accommodate the box.

L. Power and Data Floor Box (12" x 10" x 4") Cardio/Circuit Training Area -

1. Flush mounted, 4-inch deep, 11 gauge steel floor box with 11 gauge steel cover and .5- inch high mitered aluminum floor edging.
2. Stainless steel compression latches.
3. Fold back cord and cable hinged exit plate.
4. 11 gauge steel temporary construction cover.
5. Duplex receptacle mounted in 2 gang section and data outlets in 4 gang section.
6. Manufacturer FSR #FL-500P-S-4.

M. Acceptable Manufacturers - General Electric, Hubbell, Leviton, Pass & Seymour, Raceway Products, Inc., Russell & Stoll, Walker.

2.18 DIMMERS, SWITCHES AND FAN SPEED CONTROLS

A. All controls shall be UL listed specifically for the required load (e.g. incandescent, magnetic low- voltage transformer, electronic low-voltage transformer, fluorescent, fan motor). Manufacturer shall provide file card upon request.

B. All dimmers, switches, and fan-speed controls shall incorporate an air-gap switch, which shall be accessible without removing the faceplate. The air-gap switch shall be capable of meeting all applicable requirements of UL20 for air-gap switches in incandescent dimmers.

C. Dimmers, switches, and fan-speed controls shall be tested to withstand voltage and current surges in accordance with ANSI/IEEE Std. C62.41-1980.

D. Dimmers, switches, and fan-speed controls shall meet the applicable UL limited short-circuit test requirement for snap switches.

E. Dimmer control shall be linear slide. Dimmers shall provide a smooth and continuous Square Law Dimming curve.

F. Dimmers shall include voltage compensation circuitry that adjusts the firing angle of the dimmer in such a manner as to compensate light output for variations in the AC line voltage shall not be acceptable.

G. Faceplate shall snap onto device with no visible means of attachment. Heat fins shall not be visible on front of device. At locations with multiple devices, one seamless, multigang faceplate shall be provided. Contractor is responsible for coordination of proper wallbox size and faceplate type.

H. Dimmers, switches, and fan-speed controls are based on Lutron Nova style.

I. Acceptable Manufacturers - Leviton, Lightolier, Lutron, Prescolite.

2.19 CONTACTORS AND RELAYS

A. Contactors and relays shall be UL listed under UL 508, fully rated and marked for use with tungsten lamp and ballast (fluorescent) lamp loads with electrical characteristics as required. Contactors shall be of the single coil, electrically operated, mechanically held type, in NE MA 1 enclosures, or cabinets, or pull boxes with hinged covers, or integrally mounted in panelboards, or as otherwise scheduled. Control voltage shall be 120 volt, and where line voltage to unit is greater than 120 volts, phase to neutral shall contain a control power transformer with fused primary.

B. Group mounted contactors or relays shall be numbered with laminated engraved plastic plates. Mount a directory, indicating equipment controlled, on the enclosure cover, as specified for lighting panelboards.

C. Provide pilot relays where coil in-rush current is greater than the rated capacity of the remote control devices. Pilot relay contacts shall be compatible with contactor coil characteristics.

D. Units not integrally mounted in panelboards shall contain, in the enclosure, a UL listed copper ground terminal,

E. Acceptable Manufacturers - Allen-Bradley, ASCO, General Electric, Russelectric, Square D, Westinghouse, Zenith.

2.20 OCCUPANCY SENSOR SWITCHED LIGHTING CONTROL

A. Contractor shall furnish and install a complete and operable lighting control system using occupancy sensors and time-based lighting control as described in the specifications herein.

B. Work included: All sensors, circuit control hardware, electrical installation materials, labor, appliances, tools and equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this section, complete, as shown on the drawings and/or specified herein.

C. Motion sensors for small rooms shall be Wattstopper WS-200 a wall switch mounted sensor in place of a single gang or double gang wall switch(es). These wall switch sensors shall be capable of detection of motion at desk top up to 200 square feet for walking motion up to 300square feet'. Wall switch sensors shall be U.L. listed and have a load capacity of 800 watts 120V; 1200 watts 277V. Wall sensors that use ultrasonic technology will not be approved,

D. Ceiling Mounted Motion sensors for medium and large size rooms shall be Wattstopper model DT-200/300 dual technology sensors. Sensors shall be provided with power packs.

E. Sensors for use in corridors or storage aisle ways shall be Wattstopper series WT-2255 ceiling mounted sensors specifically designed to respond to walking motion with a minimum coverage pattern of 14' x 90'.

F. Sensors shall be compatible with all magnetic and electronic ballasts supplied.

G. Dual technology sensors shall use passive infrared and ultrasonic technologies. Sensors that react to noise or ambient sound will not be accepted.

H. All sensors shall have built-in timing and load control driving circuitry. Housings shall be white impact resistant plastic.

I. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction in coverage shall occur when air conditioning or heating fans are in operation or when sensor has turned off lighting due to not sensing motion.

J. All sensors shall have easily accessible, user-adjustable controls for adjustment of sensitivity of a sensor to its controlled area, and for adjustment of "Time to lights off' delay. Adjustment controls

shall be recessed in order to limit tampering.

K. In the event of sensor failure, a bypass "manual-on" switch shall be provided with each sensor. When bypass switch is utilized lighting shall remain constantly "on" or on/off control shall divert to wall switches until sensor is replaced. Override shall be accomplished without the use of the unit-specific or special tools. This control shall also be recessed to limit tampering.

L. Ultrasonic sensors operating frequency shall be crystal-controlled to within +/-0.005%, allowing for multiple sensors to operate adjacent to one another with no cross-talk.

M, Sensors requiring multiple frequencies in order to allow for individual control of adjacent areas shall not be accepted.

N. All sensors shall be provided with an indicator light to verify that motion is being detected and that the unit is operating.

O. Sensors shall be able to be wired in parallel to allow coverage of large areas.

P. All wall switch sensors shall be equipped with push button to turn "on" the lights and turn "off" the lights. Sensor shall automatically turn "off" lights if there is no movement after the present time delay interval, yet lights should remain "on" with movement. This also provides for the convenience of normal "on/off" control and avoids overuse and damage to bypass switch for normal "on/off s". This shall be accomplishable without the use of the bypass "manual-on" switch.

Q. All ceiling sensors shall be low voltage, have a rugged solid-state design, and be designed and manufactured specifically for control of lighting for energy conservation.

R. All sensors shall be manufactured by the same company, and shall be aesthetically compatible, i.e., from the same product line or generation of products.

S. Circuit Control Hardware-

1. Control Units shall be Wattstopper BZ-100 power packs - For ease of mounting , installation and future service, control unit(s) shall be an integrated self-contained unit consisting internally of load switching control relay and a transformer to provide low-voltage power to a minimum of two (2) sensors.
2. Relay Contacts shall have ratings of:
   a. 20A -120 VAC Tungsten
   b. 20A - 120.277 VAC Ballast
3. Relay contacts shall be isolated.
4. Control units shall be U.L. Listed.
5. Both Power Pack housing and leads shall be UL listed for use in air plenums.

T. Manufacturer's Services

1. The manufacturer shall provide an on-site technician to instruct the installing contractor in the proper installation and adjustment of the sensors prior to the sensors being installed. After the installation is complete, a factory technician shall inspect the system for proper operation and the installing contractor shall make any changes, adjustments or relocation of sensor necessary to facilitate a properly operating system.

U. Equipment by other manufacturers will only be considered if it meets the requirements of these specifications. Non-complying equipment will be removed by the contractor and replaced with complying material at no charge to the owner.

PART 3 - EXECUTION

3.01 EQUIPMENT CONNECTIONS

A. Provide wiring for the connection of motors and control equipment and control wiring as indicated on the Electrical Drawings.

1. Equipment installed under other sections of the Specifications - wiring shall be extended to the equipment, and proper connections made thereto.
2. Flexible connections of short lengths - Shall be provided for equipment subject to vibration or movement and for motors. Liquid-tight conduit shall be used in wet locations. A separate ground conductor shall be provided across flexible connections.
   a. Length of flexible connections for motors shall be at least 11 -inches plus 1/4-inch per horsepower up to 100 hp, and need not be longer than 36-inches unless otherwise indicated.
   b. Length of flexible connections for transformers shall be at least 11-inches plus 1/4-inch per kva up to 100 kva, and need not be longer than 36-inches unless otherwise indicated.
3. Power connections to any vibration isolated equipment shall be made with a length of flexible conduit having a 90 degree bend in it between the junction box on the equipment and any nonflexible conduit.
4. Food-service equipment provided under other sections of the Specifications - wiring shall be extended to the equipment and proper connections made thereto. Flexible connections to food service equipment shall be in liquid tight conduit.
5. Owner furnished equipment - Wiring shall be extended to the equipment, and proper connections made thereto.3.02 OUTLET BOXES

A. Wall switches shall he mounted on the strike side of the doors, as finally hung, whether so shown on the Drawings or not.

B. More than one conduit connection to outlet or junction boxes smaller than 4x4x1 Vi-inches is prohibited.

C. Outlet boxes shall be placed at heights as scheduled. Otherwise, install at the following heights, center of box to finished floor level-

1. Wall switches - 4"-0".
2. Convenience outlets and telephones - 15-inches.
3. Clock outlets - 7'-6".
4. Wall bracket outlets - 6'-6".
5. Fire alarm speak/strobes and strobes (wall mounted) - 80-inches to bottom of

device. 3.03 CONDUIT INSTALLATION

A. Coordinate installation of raceways with building structure and other mechanical trades, complete with bends, fittings, junction and pull boxes to meet codes and make complete operating systems. Raceways larger than 1-inch shall not be run in concrete slabs without approval of structural engineer.

B. Complete continuous raceway shall be provided for pulling and installation of wires. All wiring shall be run in raceways unless otherwise specified,

C. In general, conduits shall be concealed in finished areas, and may be exposed in unfinished areas, run square to the building construction, and continuous from outlet to outlet, connected mechanically and electrically to assure grounding. Conduits shall be cut square, reamed to full size, shouldered without butting into couplings or fittings. The threads shall be of standard length and diameter required for the size of the conduit used, and graphite bearing thread lubricant shall be used in making up the threads. Running threads will not be acceptable. Conduits shall have a smooth interior surface free of obstructions, shall be capped with conduit seals during the construction period, shall be uniformly sloped to eliminate trapped condensation, shall be thoroughly cleaned and dry before pulling any wire. Conduit installation shall clear hot pipes not less than 6-inches.

D. Rigid conduit or electrical metallic tubing shall not be rigidly connected to vibrating equipment. Use flexible conduit or Sealtite,

E. Conduit installation above accessible ceilings shall be such that there will be no interference with the installation of lighting fixtures, air outlets or other devices.

F. Conduit installed underground, in concrete or masonry-

1. Joints shall be made liquid-tight and shall engage not less than five threads.
2. Conduit in concrete shall be placed so that no portion of the conduit or couplings are exposed, and at a sufficient depth to prevent cracking or spalling. Conduit 1 -inch or larger shall not be placed in walls or slabs except as specifically indicated.
3. Provide red colored concrete encasement at 4 lbs. per sack for scheduled 15 KV conduit systems installed underground only.
4. Steel conduit underground which is not concrete encased shall be given cold applied protective tape coating, applied in accordance with manufacturer's instructions.
5. Structural expansion joints shall not be crossed by conduits embedded in slabs except as specifically indicated or written approval is obtained. Provide conduit expansion joints in the event such crossings are permitted.
6. Place all conduit concealed in poured-in-place structure behind reinforcement bars.

G. Exposed conduit shall be parallel with or at right angles to, building lines, beams or ceilings with symmetrical ends or metal boxes placed at changes in direction or at taps.

H. Connections to wiring enclosures - Secure conduits to outlet boxes or wiring enclosures with double lock nuts. Where conduit boxes with threaded hubs are used, conduits shall engage at least five threads in the hubs. Provide plastic insulating bushings for rigid conduits (similar to O.Z. Type A). Provide connectors with plastic insulated throats for electrical metallic tubing termination.

I. Provide cable supports at the top of vertical runs for conductors 4 AWG and larger, and otherwise where required by NEC, Article 300-19.

J. Provide 3/4-inch minimum size conduit except for switch legs which maybe 1/2-inch and 3/8-inch for lighting fixture whips.

3.4 FASTENINGS

A. Fastenings for raceways and boxes shall be made by means of toggle or expansion bolts sized for the loads imposed based on manufacturer's recommendations.

B. Fastenings to masonry or concrete shall be made by means of machine screws sized for the loads imposed based on manufacturer's recommendations.

C. Outlet box supported fixtures - Lighting outlets rigidly supported independently by means of expandable bar hangers or metal strut framing system affording a safe and substantial support for the equipment, and utilizing manufacturer's recommendations for the loads and conditions imposed. Fixtures will not be supported solely from the box cover bolts.

D. Outlet, pull, or junction boxes shall be supported from joists or other structural framing (not finish wall or ceiling panels) by expandable bar hangers or metal strut framing system.

E. Panels may be attached directly only to permanent structural walls. Support panels located on nonpermanent partition walls independent of the wall with metal strut framing system attached to permanent structure (slab or framing members).

3.5 EMPTY RACEWAY SYSTEMS

A. Provide grounded empty raceway systems with conduit, cabinets, outlet boxes, junction boxes, backboards, and miscellaneous appurtenances required for complete system. Leave

empty raceway systems complete with acceptable nylon pull cord or 12 gage galvanized steel pull wire, minimum 2 feet extra length at each end, properly tagged to indicate terminal points and length of runs (at junction boxes as well as terminations).

B. Systems shall meet requirements of, be accepted by, and be approved by the code authority, utility, equipment supplier, Owner, Contractor or subcontractor furnishing system equipment and wiring for the system involved.

C. Provide minimum 3/4-inch size empty conduit unless otherwise indicated.

D. Partial empty raceway systems include systems that allow open wiring installed above accessible ceilings utilized as plenums (with special plenum cables) or where the ceiling cavity is not utilized as an air plenum. Hollow walls with system wall outlets may serve as raceway where approved by code. Provide wall plaster frames, coverplates, and pull wire from box to above accessible ceilings.

E. Provide continuous empty raceway for-

1. Fire alarm system.
2. Security systems.
3. Automatic door system.
4. Sprinkler supervision.
5. Lightning Protection Sys-
6. Low Voltage Control.
7. Broadband RF.

F. Provide partial empty raceway for-

1. Telephone Distribution System.
2. Telephone (private).
3. Sound System.
4. Paging System, Intercom.
5. T.V. and F.M. Antenna System,
6. Low Voltage Lightatron Lighting Control Sys-
7. Elevator Controls.

G. Furnish and install empty conduit, cabinets, outlet boxes junction boxes, backboards and other miscellaneous appurtenances required for the systems specified. Conduit shall be as specified, and empty systems left complete, with nylon pull string in each unit, ends properly tagged. Backboards shall be as specified, and cabinets shall be complete with doors and snap latches as specified for "distribution panelboards".

H. Underground empty conduit intended for future use shall be identified with permanent markers indicating location and intended use. Locate at each end and at each change of direction as a minimum.

3.06 CONDUCTOR INSTALLATION

A. Wire and cable No. 10 and smaller shall be factory color coded. Provide factory color coding for No. 8 and No. 6 wire and cable or mark conductors on each end and in all junction or pull boxes with three-inch band of colored pressure sensitive plastic tape or by the use of brilliant waterproof lacquer properly applied. Colors for each phase and the neutral shall be consistent throughout the system.

B. Color coding shall be-

277/480 Volt	120/208 Volt	USE
Brown	Black	Phase 1
Purple	Red	Phase 2
Yellow	Blue	Phase 3
Gray	White	Neutral
Green	Green	Ground
	Green & White	Isolated

C. Minimum wire size for branch circuits shall be No. 12, except that home runs longer than 100 feet on 120/208 volt system, and 200 feet on 277/480 volt systems in actual wire length from panel to the electrical load center of the circuit, shall be no smaller than No. 10 AWG.

D. Cable terminals, taps and splices No. 6 and larger shall be made secure with UL listed solderless indenter compression barrel type connectors wherever practicable. UL listed set screw lugs may be used on circuit breakers, motor starters, and switches not available with indenter connections. Joints in conductors No. 8 and smaller shall be made by applying a UL listed insulated, cadmium plated, live steel spring type connector *in* sizes up to the catalog capacity of the connector.

E. Do not install wires in conduit until entire system of conduit and outlet boxes is permanently in place. Conductors shall be pulled using a UL listed wire lubricant when pulling tension exceeds 500 pounds.

F. Conductors in conduits shall be continuous and without splices except in junction boxes. Indenter compression barrel type lugs shall be used for stranded conductor terminations except UL listed bolted compression type connectors or lugs, factory furnished on such devices as circuit breakers, switch units and motor starters, may be utilized. Indenter compression type connections shall be used to make splices, taps and motor connections.

G. Insulate splices, taps, and connections such that the insulation of the joint is no less than the insulation of the wire. Insulate with manufactured lock-on splice caps or build up with rubber tape applied directly to the joint, and then cover with thermoplastic electrical tape.

H. Exercise care when installing wire in conduit so as to prevent injury to the conductor insulation. Mechanical means of pulling shall not be used unless approved. Conductors shall be pulled using UL listed lubricant.

I. Whenever wiring leaves the conduit and terminates at a terminal board, the wiring shall be formed and laced with waxed twine, or plastic wire ties.

J. In the event circuits feed through outlet boxes, provide splice and pigtail for device connection, with sufficient slack to pull splice out of box at least 6-inches (for inspection).

K. Switched duplex receptacles - The ungrounded pole of each receptacle shall be provided with a separate terminal. Top receptacle shall be switched when installed.

3.07 GROUNDING INSTALLATION

A. The grounding electrode shall be provided in strict accordance with Article 250 of the National Electrical Code. Resistance to ground shall be 5 ohms or less.

B. Refer to grounding riser diagram on E401 for the grounding electrode requirements.

C. The following items or sub-systems are to be interconnected to the single grounding electrode-

1. Secondary electric service neutral conductors.
2. Neutral conductors of separately derived systems including transformers, UPS system outputs, motor generator outputs and engine generator outputs.
3. Metallic water piping systems.

4. Building concrete encased foundation electrode.
5. Lightning protection system.
6. Building structural steel (where available).
7. Electrical equipment enclosures and raceway systems.
8. Equipment grounding conductors.
9. Surge arrestor discharge connections.
10. Medium voltage cable shields.

3.09 OCCUPANCY SENSOR SWITCHED LIGHTING CONTROL

A. It shall be the contractors' responsibility to provide the quantity of motion sensors required for complete and proper volumetric coverage without gaps within the range of coverage(s) of controlled areas. Rooms shall have one hundred (100) percent volumetric coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective room. Proper judgement must be exercised in executing the work so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components.

B. Sensors shall be installed and adjusted in strict accordance with the manufacturer's instructions.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 CODES AND STANDARDS

A. Workmanship, material and equipment shall be in accordance with Specifications and Drawings and in some instances the requirements exceed those required by codes and standards. Where not exceeded, the codes and standards shall be considered as absolute minimum requirements.

B. All materials, appliances, equipment and devices provided under this contract must meet the requirements of Underwriters Laboratories (UL) Standards.

C. Refer to NEC, for definitions of terms used in the Drawings, Specifications, etc. These definitions, in conjunction with local authorities interpretation, convention and common usage, will apply.

D. Refer to Section 2300, Article 1.03 for governing building code information.

1.3 REFERENCE ABBREVIATIONS

A. References are made in the various Electrical Sections to technical societies, codes, specifications, trade organizations, and regulatory authorities in accordance with the following abbreviations:

ADA-	Americans with Disabilities Act.
FM-	Factory Mutual.
FS-	Federal Specification.
IEEE -	Institute of Electrical and Electronics Engineers.
IPCEA -	Insulated Power Cable Engineers Association,
IRI -	Industrial Risk Insurors.
ISO-	Insurance Services Organization.
NEC-	National Electrical Code (NFPA Pamphlet No.
NEMA-	National Electrical Manufacturer's Association.
NETA-	International Electrical Testing Association, Inc.
NFC -	National Fire Codes.
NFPA -	National Fire Protection Association.
UL-	Underwriters Laboratories, Inc.

1.04 PERMITS

A. Obtain all certificates of inspections, patent rights and licenses that are required for the performing of this work by all laws, ordinances, rules and regulations or orders of any officer and/or body. Provide all notices necessary in connection therewith, and pay all fees relating thereto and all costs and expenses incurred on account thereof. No work shall be covered before inspection by the jurisdiction authorities and observation by the Architect/Engineer.

1.05 EXPLANATION OF SPECIFICATION/DRAWING PRECEDENCE

A. The Contractor shall be responsible for becoming thoroughly acquainted with all Contract Document contents that affect his work under this contract. Work required under this section includes, but is not limited to, all material, equipment transportation, services and labor required to complete the entire electrical system as required by the Contract Documents.

B. The Specifications and the associated Drawings are complimentary, and any portion of the work described in one shall be provided as if described in both.

C. For purposes of clearness and legibility, the Drawings are essentially diagrammatic, and, although size and location of equipment are drawn to scale wherever possible, the Contractor shall make use of all data on the Contract Documents and shall verify this information at building site.

D. Where the Contract Documents are in conflict, obtain clarification of such during bidding. Clarification will only be given in written addendum form. When addenda for clarification of such cannot be delivered in a timely manner, the Contractor shall base his bid on the higher standards or more restrictive requirements. In the event of discrepancies in the Contract Documents after the bid period, the Contractor shall advise the Architect/Engineer of same prior to proceeding with the work in question in order that correct progress of the work may be ensured.

E. The drawings indicate required size and points of termination of conduit, bus ducts and cable trays, and suggest proper routes to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets, and it shall be the responsibility of the Contractor to make the installation in such a manner as to conform to the structure, avoid obstructions, preserve headroom, keep openings and passageways clear and maintain required servicing clearances without further instructions or additional costs to the Owner.

F. It is intended that all electrical devices, conduit, etc. be located symmetrically with all architectural elements. Refer to Architectural, Structural, Plumbing, Fire Protection, Mechanical and Electrical Specifications and Drawings in completing the required coordination.

G. The Contractor shall fully inform himself regarding any and all peculiarities and limitations of the spaces available for the installation of all work and materials furnished and installed under this Contract. He shall exercise due and particular caution to determine that all parts of his work are made readily accessible.

H. The Contractor shall study all drawings and specifications to determine any conflict with all applicable ordinances and statutes. Any discrepancies shall be reported to the Owner's Authorized Representative, and any changes shall be shown on the as-built drawings with the additional work performed at no cost to the Owner.

B. Reference catalog cuts and brochures of products to proper paragraph in Specifications. Furnish numerical index by Specifications paragraph number listing product name, catalog number and reference to page number of submittal brochure.

C. Cross reference individual catalog numbers of substitute products to numbers of specified materials.

D. Bind submittal in booklet form.

E. Requests for permission to use substitute or alternate products shall be accompanied with evidence to prove that the product-

1. Conforms with the standard of performance and quality specified.
2. Will physically fit in the space allocated, with sufficient access and maintenance space.
3. Will not entail changes in details and construction of related work whether mechanical, electrical, or general in nature.
4. Involves no additional costs to the Owner or extended construction time.
5. Provide submittal on specified item for comparison to substituted or alternate item.

F. Requests for permission to use substitute or alternate products shall be immediately brought to the Architect's attention. In the event that the use of these products may be determined to result in a material or labor savings to the Contractor, then the amount of these savings as a credit to the Owner will be required to assist in determination of acceptability of the product. Provide drawings, specifications, samples, performance data and other information as may be required to assist in determination of acceptability of the product.

G. Equipment Items-

1. Submit manufacturer's certified data relative to equipment required for the installation of the electrical systems.
2. Submit adequate engineering data on each piece of equipment to allow a careful check of compliance with the technical requirements of the Contract Documents. Clearly indicate on submitted data the manufacturer's name, piece number, equipment capacity, and other applicable technical data.
3. Data for Electrical Systems:
    a. Engine Generator Sets.
    b. Underfloor Raceways.
    c. Cable Trays.
    d. Automatic Transfer Switches.
    e. Switchboards.
    f. Transformers.
    g. Panelboards.
    h. Fire Alarm Systems.
    i. Lightning Protection.
    j- Lighting Fixtures.
    k. Lighting Control System
    I. Disconnect Safety Switches.
    m. Raceways and Fittings.
    n. Motor Starters.
    0. Switches.
    P- Underground Conduit.
    q- Wires and Cables.
    r. Wiring Devices and Wall Plates

4. Shop Drawings: Submit 1/4-inch minimum scale coordinated Shop Drawings relating to the equipment, and foundations, and dimensioned locations of each, including accessories, and showing clearances for operating and servicing.
    a. Electrical Room Layouts.
    b. Electrical Closets.
    c. Major conductor routing.
    d. Electrical Equipment (Emergency Generator, etc.) Room Layouts.

1.7 INSTRUCTIONS

A. When specified in other Sections, furnish the services of competent instructors who will give full instruction to designated personnel in the adjustment operation, and maintenance, including pertinent safety requirements of the equipment or system specified. Each instructor shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Owner for regular operation. Coordinate time frame with Owner.

B. The number of man-days of instruction to be furnished shall be as specified in the various Sections of the Specifications.

1.8 OPERATING AND MAINTENANCE MANUALS

A. Unless required otherwise by Division 1, Division 16 operating and maintenance manuals shall be provided as described below.

B. Bind in looseleaf binders with the words, "Operating and Maintenance Manual" and the Project identification imprinted on the cover. Prepare three complete sets of records for the Owner, with table of contents, index, and tabbed section dividers.

C. During the construction period, accumulate the following for inclusion in the Operating and Maintenance Manuals-

1. Copies of warranties and guarantees on each piece of equipment installed.

2. Fixture brochures.
3. Wiring and control diagrams.
4. Approved Shop Drawings.
5. Operating instructions for-
   Electrical Systems
   Fire Alarm System
   Standby Generator
   Lighting Control System
6. All required testing documents.
7. Short circuit and coordination study.
8. Recommended maintenance procedures.
9. Lists of major items of equipment with name, address, and telephone number of each local representative.

D. Submit the manuals for approval at approximately 75 percent job completion.

E. Each manual shall consist of-

1. Complete description of each item of equipment and apparatus furnished and installed - including ratings, capacities, and characteristics.

Fully detailed parts list, including all numbered parts of each item of equipment and apparatus furnished and installed

2. Manufacturer's printed instructions describing operation, servicing, maintenance and repair of each item of equipment and apparatus.
3. Typewritten record of all tests made of materials, equipment, and systems. All such records shall state the date tests were conducted, the names of all persons making and witnessing the tests, and citing any unusual conditions relevant to the tests.

1.9 RECORD DRAWINGS

A. Unless required otherwise by Division 1, Division 16 Project Record Documents shall be provided as described below.

B. Accumulate Project Record Drawings during the construction of the Project. Keep one set of blueline Contract Drawings at the job site at all times. Mark changes, rerouting or modifications which occur clearly on the Drawings with dimensions.

C. Periodically, those drawing may be reviewed by the Architect, Engineer or Owner to verify currency prior to approval of pay applications.

D. Provide record drawings as outlined in Specification Section 01780, 1.07, A through 6.

1.10 OWNER-FURNISHED, CONTRACTOR-INSTALLED EQUIPMENT (OFCI)

A. Install and make all necessary electrical connections to scheduled/designated Owner-furnished equipment. See plans and schedules.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer's names and catalog numbers are scheduled or specified for the purpose of establishing standard of design, quality, appearance, performance and serviceability, and not to limit competition. Scheduled products (as may be modified by detailed specifications) are those selected as the basis for system design with respect to physical size and space arrangements, required capacity and performance characteristics, and the product quality intended.

B. The Drawings indicate scheduled products physically arranged in the spaces, based on catalog

data of specific manufacturers.

C. Listed "Acceptable Manufacturers" are those considered capable of manufacturing products conforming to detailed specifications, and as such, are invited to compete on an equal basis provided the offering is comparable in every respect to scheduled or specified products and actually conforms to the detailed specifications and schedule requirements. Listing herein as "acceptable manufacturers" does not imply "accepted", "approved", "prior approval", or any other such connotation. All product offerings must be submitted for approval after Contract award.

D. Refer to Section 01630 for product substitution procedures.

E. Manufacturers of materials and equipment shall be as specified, scheduled, or as listed in each respective product Specification Article.

2.2 FLAME SPREAD AND SMOKE DEVELOPED PROPERTIES OF MATERIALS

A. Materials and adhesives used throughout the electrical systems shall have a flame spread rating not over 25 without evidence of continued combustion and with a smoke developed rating not higher than 50. If such materials are to be applied with adhesives, they shall be tested as applied with such adhesives, or the adhesives used shall have a flame spread rating not over 25 and a smoke developed rating not higher than 50. (Note - materials need not meet these requirements where they are entirely located outside of a building and do not penetrate a wall or roof, and do not create an exposure hazard or where specifically exempted in the body of these Specifications.)

B. "Flame Spread Rating" and "Smoke Developed Rating" shall be as determined by the "Method of Test of Surface Burning Characteristics of Building Materials, NFPA No. 255, ASTM E84, Underwriters Laboratories, Inc., Standard". Such materials are listed in the Underwriters Laboratories, Inc. "Building Materials List" under the heading "Hazard Classification (Fire)".

2.3 IDENTIFICATION OF CONDUIT AND EQUIPMENT

A. Identify electrical equipment with nameplate bearing equipment name and number, using bevel edges, 1/16-inch thick, 1-1/2-inch white laminated bakelite with engraved black letters, l/2-inch (double line) or 7/8-inch (single line) high, permanently mounted on the equipment in a conspicuous place with screws. Cardholders with card identification will not be accepted.

B. Underground Warning Tapes For Buried Lines-

1. Provide 3-inch wide metallic core brightly colored polyethylene detection tape, shallow buried in the trench above non-metallic conduits, serving the dual purpose of line location and identification. The tape shall be easily detected by any commonly used metal detector and shall bear a printed message (continuous along entire length) describing the contents of the line beneath.

C. Panelboards - Provide nameplates to identify each section as specified for electrical equipment. Type identification cards/panel directory for insertion in card holder pockets in each lighting and appliance panelboard. Photo-reduce as necessary to fit card holders.

D. Provide nameplates to identify motor starters, disconnect switches, time clocks, transformers, and miscellaneous electrical equipment as to systems or mechanical equipment served, or specific function as appropriate.

E. Nameplates and tags shall correspond to the Record Drawings.

F. Submit complete details of identification legends, color fields, and sizes, coordinated between trades.

G. Acceptable Manufacturers - Seton Nameplate Corporation, W.H. Brady, Westline.

2.4 BEARINGS

A. Refer to Section 22-230000.

2.5 ELECTRIC MOTORS

A. Refer to Section 22-230000.

2.6 MOTOR STARTERS

A. Except where located in motor control centers or otherwise specified or scheduled, each starter shall be furnished by the Supplier who furnishes the equipment it controls.

B. Provide a manual or magnetic starter for each motor as recommended by the Equipment Manufacturer and provided by the supplier of the equipment except as stated in 16010-2.06.E.

C. Magnetic starters shall be full voltage, nonreversing, across-the-line type with overload protection for each phase wired with normally closed contacts in series control circuit ahead of any other control contacts on the control side of the solenoid coil, and no contacts between the other side of the solenoid coil and the control power source. Motor starters shall conform to NEMA ICS 2, Class A Standards and include a 120 volt (maximum) control circuit and control power transformer of sufficient capacity to operate connected pilot, indicating and control devices, plus 100% spare capacity. Coordinate control transformer size with Building Control, Building Automation and/or Building Management System Contractor.

D. Where individual starters and disconnect switches (or circuit breakers) are indicated to be in the same location, furnish combination devices in a common housing. Carefully coordinate between trades to assure supply responsibility and capacity.

1. Fusible Disconnecting Means: NEMA KS 1, heavy-duty, fusible switch with rejection type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 947-4-1, as certified by an NRTL.
2. Nonfusible Disconnecting Means: NEMA KS 1, heavy-duty, nonfusible switch.
3. Circuit Breaker Disconnecting Means: NEMA AB 1, motor-circuit protector with field adjustable, short circuit trip coordinated with motor locked-rotor amperes.

E. In every instance where magnetic starters are not required, furnish NEMA ICS 2, general purpose, Class A manual starters for fractional horsepower single phase motors with toggle action and overload protection.

F. When interlocking or automatic control of single phase motors is indicated or required, the motors shall be furnished with magnetic across-the-line starters.

G. When interlocking or automatic control of electric heaters is indicated or required, the heaters shall be furnished with contactors. Provide control power transformers as required to maintain control circuit voltages not exceeding 120 volts.

H. Provide with each magnetic starter a reset button, pilot light, and HAND-OFF-AUTO switch, heavy duty type, mounted in starter cover.

I. Motor starters shall be provided with provisions for interfacing with the Energy Management System (EMS) or other control and interlocking requirements.

1. For each motor requiring operational status monitoring by the Controls System as defined in the Controls Sections of this specification, provide a current sensing relay on one of the motor feeder legs. This relay shall be compatible with the motor amperage and shall have sensitivity adjustment and field selectable N.O./N.C. terminal connections. This relay shall be furnished by the Supplier of the motor starter who shall carefully coordinate the requirements with the Controls System Contractor.
2. For all magnetic motor starters, whether a current sensing relay is required or not, a minimum of one set of field reversible auxiliary contacts shall be provided with the starter.

J. Acceptable Manufacturers: ABB Control, Inc.; Allen Bradley Co. (Rockwell Automation); Cutler-Hammer Products (Eaton Corp.); General Electric Co.; Square D; Westinghouse.

2.07 FIXED APPLIANCE DISCONNECTING MEANS

A. All motor operated and non-motor operated fixed appliances shall be provided with factory disconnecting means where practical.

B. Where factory disconnecting means are unavailable or not provided, it is the responsibility of the Electrical Contractor to provide a disconnecting means that meets the standards set in the National Electrical Code (NEC).

C. The Electrical Contractor shall verify with the AHJ whether the disconnecting means may be located out of the visual field from the fixed appliance to be disconnected.

2.8 CIRCUIT BREAKERS AND SWITCHES

A. All circuit breakers and switches in switchgears, swithboards, distribution panelboards, motor control centers, and power panelboards shall be provided with permanent mounted locking provisions.

B. Circuit breakers supplying appliances in lighting and appliance panelboards shall be provided with locking provisions for all loads supplied where the equipment is not provided with a local means of disconnect.

2.9 SLEEVES, INSERTS, ANCHORS AND SUPPORTS

A. Provide in concrete, carpentry or masonry construction, hangers, sleeves, expansion bolts, inserts, supporting steel, or other fixtures necessary for the support of equipment and devices furnished under each Section of the Specifications.

B. Except as otherwise indicated or specified, each conduit, passing through walls, floors, ceilings or partitions shall be provided with sleeves having internal diameters approximately 1 -inch larger than the outside diameter of conduit.

C. Sleeves through interior partitions and floors shall be no less than 22 gage galvanized steel, set flush with the finished surfaces.

D. Sleeves through precast or post-tensioned structures shall be no less than Schedule 40 galvanized steel pipe and shall be subject to the acceptance of the designer of the structure. Submit size, location, and sleeve material for Structural Engineer review and acceptance.

E. Sleeves through grade slabs, basement or exterior wall shall be steel or cast iron conduit with water stop flange, set flush with finished surfaces, and with the space between the pipe and the sleeves packed with oakum or jute twine and caulked watertight. Sleeves for ground wires and telecom runs shall be schedule 40 PVC.

F. Sleeves in wet or potentially wet floors or spaces such as equipment rooms or sprinklered areas shall be Schedule 40 galvanized steel pipe with water stop flange and with the top of the sleeve projecting 2-inches above the finished floor, with annular space packed with oakum or jute twine and caulked watertight.

G. Option - Provide link-seal neoprene closure fittings in lieu of packing.

H. Attachments to structure shall be by means of beam clamps wherever practicable. Unavoidable attachments to concrete structure shall be by means of pre-set concrete inserts whenever the need for such attachment can be reasonably foreseen and the locations and sizes of inserts is known prior to pouring of concrete. In instances where it is necessary to make attachments to concrete and proper inserts have not been pre-set, the attachment shall be made by means of drilled holes and expansion anchors of either the bolt stud or flush variety. Design working stress of attachments shall be limited to 25 percent of the average maximum (ultimate) stress values published by the manufacturer.

I. Inserts shall be cast iron or galvanized steel individual type, with accommodations for removable nuts and threaded rods up to 3/4-inch diameter, and permitting lateral adjustment.

J. Fasteners in concrete beams shall be sufficiently above the bottom of the beam to clear reinforcing.

K. Expansion anchors shall be zinc and chromate plated for corrosion protection and conform to the dimensional requirements of Federal Specification FF-S-325. Expansion anchors shall be selected and installed in accordance with the recommendations of Expansion Anchor Manufacturer's Institute (EAMI) and the manufacturer's instructions.

L. Acceptable Manufacturers - Grinnell, Hilti, Phillips, or Thunderline.

2.10 FIRE-STOPPING

A. Seal annular spaces between sleeves and penetrating materials in fire-rated floors, ceilings, and walls with fireproof and waterproof silicone elastomer applied in accordance with the manufacturer's published instructions. Multiple penetrations shall be sealed with silicone foam; single penetrations may be sealed with silicone caulking. Seal material shall be UL classified for use in fire-rated penetration seals, and shall be applied in the manufacturer's recommended thickness for the fire rating of the penetrated structure in accordance with ASTM-E-814 requirements.

B. Refer to Section 15010 and Division 7 for further requirements.

2.11 WATERPROOFING

A. Seal penetrations of wet or potentially wet structures, floors, exterior walls, etc., other than those requiring fire-stopping, with sealant to prevent moisture leakage. Apply sealing material (caulking) in accordance with manufacturer's published instructions.

B. Product Research and Chemical Co. "Poly-Sulphide Sealant" PRC-5000.

2.12 AUXILIARY STRUCTURAL SUPPORTS

A. Provide auxiliary structural supports as necessary to support electrical systems from above or below the building structure. Coordinate with the Structural Drawings. Supporting members shall be metal strut framing or standard structural shapes, designed to support imposed loads with a working stress no greater than 25 percent of ultimate stress values of the members,and designed to attach to the building structure without exceeding structural limitations at the points of attachment. Prepare calculations and Shop Drawings of each such support and submit to the Structural Engineer for acceptance. Begin no work until receipt of acceptance from the Structural Engineer.

B. Refer to Division 5 for additional requirements.

2.13 ESCUTCHEONS

A. Provide escutcheons or 22 gage minimum painted galvanized sheet metal wall flanges (in event standard manufactured product does not exist) for electrical penetrations of floors, ceilings, walls or partitions. Escutcheons shall be sized to enclose the outside of the penetration sleeve and fit snugly to the pipe (or over outside of insulation) of insulated lines. Both exposed surfaces of such penetrated elements shall be fitted with escutcheons which shall both afford a finished appearance and prevent passage of vermin.

B. Except where otherwise specified, escutcheons shall be one-piece (where practicable) or split, hinged, stamped brass type designed to fit the pipe, and to cover the terminating pipe sleeve, in chrome plated finish, with securing device to hold the escutcheon tight to the pipe.

C. Use deep escutcheon on each sleeve set in a waterproof concrete floor.

D. Acceptable Manufacturers - Beaton and Corbin, Grinnell, Sweet and Donaldson.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Refer to Division 1 for general demolition requirements and procedures.

B. Disconnect, demolish and remove work as specified under Division 16 and/or as indicated on the drawings.

C. The Contractor shall use no means of demolition that will result in damage to structures, materials, equipment or components indicated to remain or endanger the safety and welfare of the general public. The use of explosives is strictly prohibited. Where wiring, conduit, light fixtures, equipment or components to remain are damaged or disturbed, remove damaged portions and install new products of equal capacity and quality, subject to approval of the Owner's Authorized Representative.

D. Scope -

1. Before beginning demolition, make all arrangements required to turn off and disconnect utilities and other such facilities involved.
2. The Owner has the right of first refusal of all removed materials as indicated on the Contract Documents. All items designated to be turned over to the Owner shall be presented to him as he may direct.
3. All items to be removed and relocated shall be removed and responsibly stored, cleaned, repaired, reinstalled (complete with new fittings, trim, etc.) reconnected and made operational by the Contractor.
4. All other demolished items shall become the Contractor's property and shall be disposed of in accordance with all applicable codes and regulations or responsibly salvaged. All costs associated with disposal or salvaging are the Contractor's responsibility.

3.2 ELECTRIC WIRING OF MOTORS AND EQUIPMENT

A. Power wiring and disconnect switches for the proper isolation of each piece of equipment shall be provided under the electrical sections of the specifications, as necessary for operation in the "HAND" position of the HAND-OFF-AUTO control switch.

B. The electrical design is based on the equipment listed in the schedules. Parties furnishing equipment requiring changes in the electrical design shall pay costs involved in modifying the electrical design to accommodate the equipment involved.

C. Interlock wiring for the mechanical systems shall be provided under the electrical sections of the specifications, as necessary for operation in the "HAND" position of the HAND-OFF-AUTO control switch. Wiring shall be in strict accordance with wiring diagrams, previously submitted and reviewed "acceptable." Systems include:

1. Plumbing.
2. Fire Protection.
3. Heating, Ventilating, Cooling.

D. Electrical Contractor shall -

1. Provide power wiring to junction boxes for control panels including DDC panels for air terminal boxes, air handling units, etc.
2. The drawings indicate the following 120V/1 Ph./60 Hz., 20-amp circuits provided for the EMS Contractor by the Electrical Contractor -
   a. Two (2) circuits at each Mechanical Room.
   b. One (1) circuit in each Electrical Room.
   c. One (1) circuit in each Telephone/Data Room.
3. Provide conduit with pull string to equipment outside of the main building structure that requires remote mounting of controls, including but not limited to air-cooled chillers, emergency generators, cooling towers, electric meter, etc.
4. Furnish smoke detectors to be installed in ducts and at return air openings by the Sheet Metal Contractor.

5. Provide signal wiring from all fire alarm devices to the Fire Alarm System as required in Division 16 specifications.
6. Provide signal and damper actuator power wiring as required to operate duct mounted smoke and fire/smoke dampers at rated partitions, shafts, walls and floors. Coordinate with the Sheet Metal Contractor and the EMS Contractor as necessary.
7. Provide signal wiring, as required, from the Fire Alarm System to the EMS.

3.3 HAZARDOUS LOCATIONS

A. Electrical wiring in hazardous locations shall be furnished and installed in accordance with National Electrical Code.

B. "Hazardous Locations" shall be as defined in the National Electrical Code.

3.4 PROTECTION OF EQUIPMENT

A. Protect equipment from physical damage and deterioration after it is delivered to the Project, and during the installation period prior to Owner acceptance.

B. The equipment shall be kept clean. Motors and electrical devices shall be covered with suitable materials to prevent dirt or dust accumulation within equipment. Machinery and devices shall be properly oiled and maintained to prevent rusting and deterioration.

C. Repair scratches, mars, or paint deterioration.

3.5 EXCAVATION AND BACKFILL

A. Perform excavation and backfill required for the installation of underground conduit as required by Division 2.

3.6 EQUIPMENT SPACE

A. The Drawings indicate scheduled products physically arranged in the spaces, based on catalog data of specific manufacturers.

B. Prepare Shop Drawings indicating the exact physical space requirements for equipment and servicing of equipment actually purchased for each item of equipment involved, and electrical connections, and be fully responsible for costs or modifications required for the installation.

3.7 EQUIPMENT FOUNDATIONS

A. Floor mounted electrical equipment shall be mounted on concrete housekeeping pads at least 4-inches high, poured integral with the floor slab wherever practicable.

B. Pads shall extend a minimum of 15-inches in front of equipment where necessary to afford operating surface no more than 78-inches beneath the center of the highest operating handle in its position.

C. Coordinate pad sizes and locations.

D. Furnish templates for bolt installation, along with the anchor bolts.

E. Provide isolation materials and inertia blocks, see Vibration Isolation Section for specific requirements.

F. Provide necessary supporting steel required for the electrical systems.

G. Set equipment, and grout the equipment to the base, and fill void spaces with nonshrinking grout. Dowel direct driven equipment and driving motors to their common mounting frame after final alignment and run-in.

3.8 SUPPORTS, SEISMIC DESIGN

A. Provide anchors, connections, bracing or other supports necessary to prevent damage to electrical systems or equipment, or to the building structure from such, as a result of an earthquake producing design horizontal seismic forces.

B. Refer to Section 15200 for vibration isolation and seismic design requirements.

3.9 INTERFERENCES

A. Relocate or reroute existing wiring, as required to facilitate construction of finished work as planned. Restore surfaces, insulation, and finish to match condition of adjacent work.

3.10 CUTTING AND PATCHING

A, Assume costs and responsibility for cutting and patching required to complete the installation.

B. Patch surfaces to the condition of the adjacent surfaces.

3.11 PAINTING AND FINISHING AND CLEANING

A. Finish painting (other than factory applied) of electrical equipment and its associated conduit and devices shall be as specified in Division 9 "Painting" Section(s). Provide touch-up painting of pre-finished electrical products.

3.12 OPTION TO RELOCATE OUTLETS AND RELATED DEVICES

A. Lighting fixtures, convenience outlets, floor outlets, telephone outlets may, at the Owner's option, be relocated to a point within 10 feet of the location indicated on the Drawings, at no additional cost to the Owner, provided the Contractor is advised of this relocation before Shop Drawing preparation or roughing-in begins.

B. Only work which must be re-performed in this connection will be considered extra.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes general requirements for electrical field testing and inspecting. Detailed requirements are specified in each Section containing components that require testing. General requirements include the following:

1. Qualifications of testing agencies and their personnel.
2. Suitability of test equipment.
3. Calibration of test instruments.
4. Coordination requirements for testing and inspecting.
5. Reporting requirements for testing and inspecting.

B. Allowances: Electrical tests and inspections specified in various Division 13 and 16 Sections are covered by a testing and inspecting allowance specified in Division 1 Section "Allowances." See Division 1 Section "Allowances" for what is included in allowance amount, the amount of the allowance, payment procedures for allowances, changes to allowance amounts, and disposition of unused portions of allowance.

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: As specified in each Section containing electrical testing requirements and in subparagraph and associated subparagraph below.

1. Independent Testing Agencies: Independent of manufacturers, suppliers, and installers of components to be tested or inspected.

a. Testing Agency's Field Supervisor for Power Component Testing: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Division 16 power component Sections.

B. Test Equipment Suitability: Comply with NETA ATS, Section 5.2.

C. Test Equipment Calibration: Comply with NETA ATS, Section 5.3.

PART 2 -

A. Equipment and Materials

a. Provide all meters, instruments, equipment and materials necessary for performance of tests.

b. Testing apparatus, not part of the permanent installation, shall remain the property of the Contractor.

c. Provide gaskets, lubricants and other expendable materials required to be replace during the prosecution of the work.

d. Provide fuel, if any, as required for test.

PART 3 - EXECUTION

3.1 ELECTRICAL

A. Equipment - Shall be tested and adjusted to insure correct functional performance. Inspect, lubricate, test and adjust equipment and correct defects or damages before connecting the equipment to the system.

B. Wiring-

1. Test power, lighting and control wiring or bus duct for continuity, short circuits and improper grounding.
2. Test each grounding circuit separately for continuity.
3. Values of insulation resistance shall meet the standards established by the National Electrical Testing Association (NETA).
4. If faults are detected, the point or points of such fault shall be located and the defective wiring replaced at the Contractor's expense.

C. High Potential Testing (HIPOT)-

1. High voltage cable will be tested by Owner. If testing fails, the contractor will make required correction and have the same testing facilities which was used by the Owner retest the cables. Corrections and retest will be at the Contractors expense.
2. Testing shall be in accordance with the IPCEA-NEMA S-19-81, S-68-516, S-66-524, S-61 - 402, or NEMA SG5 "Dielectric Tests in the Field", as applicable.
3. TestVoltage-
   a. 12.47 kv rated system - 27 kv, ac (preferred), or 37.5 kv, dc.
4. Test period - Apply test voltage to each phase conductor for 1 minute.

D. Acceptance Tests - Leave the entire electrical system installed under this Contract in proper working order. Upon completion of the installation, an acceptance test shall be run to ascertain that starters, circuit breakers, motors, relays, indicating lights, pushbuttons, alarm devices and other electrical equipment and controls are operating correctly as required for the overall operation of the facility.

E. Submit certified reports indicating full compliance with test requirements.

F. Make replacements or repairs to tested products which are damaged as result of tests.

G. Schedule tests at a time convenient to required witnesses or persons affected by the tests.

H. Give written notification for test procedures, prior to the test.

I. Upon completion of the work, recheck electrical connections, cable to bus, cable to panels, bus to bus, throughout the job for tightness.

J. Check motors for correct rotation.

B. K. Test electrical systems grounding prior to completion of the work. Note ground resistance together with method of testing. For ground rods, note the soil condition at the time measurements were made. Ground resistance shall not exceed 5 ohms.

L. Test feeder and power circuits No. 8 AWG or larger with a "Megger" from each conductor to ground and between conductors. Record each reading. At the completion of work certify the results of the "Megger" testing.

M. After the electrical equipment and the wiring is installed, and prior to energizing for the first time any section of the electrical system, test phase-to-phase and phase-to-ground insulation on feeders and sub-feeders switchboards, dry-type transformers, motors, and other pieces of electrical equipment to assure that they have the proper insulation and are free of grounds. Systems rated above 250 volts shall be tested with a 1000 volt Megger. Circuits rated at or below 250 volts shall be tested with a 500 volt Megger.

1. Perform insulation-resistance tests.

B. Test and Inspection Reports: In addition to requirements specified elsewhere, report the following:
1. Calibration and adjustment settings of adjustable and interchangeable devices involved in tests.
2. Tabulation of expected measurement results made before measurements.
3. Tabulation of "as-found" and "as-left" measurement and observation results.

END OF SECTION

SECTION 26 05 19 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

A. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

B. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver wires and cables according to NEMA WC 26.

1.6 COORDINATION

A. Coordinate layout and installation of cables with other installations.

B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Architect.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wires and Cables:
   a. American Insulated Wire Corp.; Leviton Manufacturing Co.
   b. BICC Brand-Rex Company.
   c. Carol Cable Co., Inc.
   d. Senator Wire & Cable Company.
   e. Southwire Company.
2. Connectors for Wires and Cables:
   a. AMP Incorporated.
   b. General Signal; O-Z/Gedney Unit.
   c. Monogram Co.; AFC.
   d. Square D Co.; Anderson.
   e. 3M Company; Electrical Products Division.

2.2 BUILDING WIRES AND CABLES

A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Wire and Insulation Applications" Article.

B. Rubber Insulation Material: Comply with NEMA WC 3.

C. Thermoplastic Insulation Material: Comply with NEMA WC 5.

D. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 8.

E. Conductor Material: Copper.

F. Stranding: Solid conductor for No. 10 AWG and smaller; stranded conductor for larger than No. 10 AWG.

G. Plenum rated cable for all cables above the ceiling.

2.3 CONNECTORS AND SPLICES

A. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation requirements and as specified in Part 3 "Wire and Insulation Applications" Article.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRE AND INSULATION APPLICATIONS

A. Service Entrance: Type RHW or THWN, in raceway.

B. Feeders: Type 75C insulation THHN/THWN, in raceway.

C. Fire-Pump Feeder: Type MI, 3-conductor.

D. Branch Circuits: Type THHN/THWN, in raceway.

E. Fire Alarm Circuits: Type THHN/THWN, in raceway.

F. Class 1 Control Circuits: Type THHN/THWN, in raceway.

G. Class 2 Control Circuits: Type THHN/THWN, in raceway.

H. Equipment or any device rated 100 amperes or less, conductor shall be rated 60C as per National Electrical Code.

I. Equipment or any device rated over 100 amperes, conductor shall be rated 75C as per National Electrical Code.

3.3 INSTALLATION

A. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."

B. Remove existing wires from raceway before pulling in new wires and cables.

C. Pull Conductors: Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section "Basic Electrical Materials and Methods."

G. Seal around cables penetrating fire-rated elements according to Section "Firestopping."

H. Identify wires and cables according to Section "Basic Electrical Materials and Methods."

I. Identify wires and cables according to Section "Electrical Identification."

3.4 CONNECTIONS

A. Conductor Splices: Keep to minimum.

B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.

C. Use splice and tap connectors compatible with conductor material.

D. Use oxide inhibitor in each splice and tap connector for aluminum conductors.

E. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

F. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.

G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Testing: On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes grounding and bonding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

B. Related Sections include the following:

1. Section "Underground Ducts and Utility Structures" for ground test wells.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Data: For the following:

1. Ground rods.
2. Chemical rods.

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

D. Field Test Reports: Submit written test reports to include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1. Comply with UL 467.

B. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.

C. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductors, Cables, Connectors, and Rods:
    a. Apache Grounding/Erico Inc.
    b. Boggs, Inc.
    c. Chance/Hubbell.
    d. Copperweld Corp.
    e. Dossert Corp.

f. Erico Inc.; Electrical Products Group.
g. Framatome Connectors/Burndy Electrical.
h. Galvan Industries, Inc.
i. Hastings Fiber Glass Products, Inc.
j. Ideal Industries, Inc.
k. ILSCO.
l. Kearney/Cooper Power Systems.
m. Korns: C. C. Korns Co.; Division of Robroy Industries.
n. Lightning Master Corp.
o. Lyncole XIT Grounding.
p. O-Z/Gedney Co.; a business of the EGS Electrical Group.
q. Raco, Inc.; Division of Hubbell.
r. Robbins Lightning, Inc.
s. Salisbury: W. H. Salisbury & Co.
t. Superior Grounding Systems, Inc.
u. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Section "Conductors and Cables."

B. Material: copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

E. Grounding Electrode Conductors: Stranded cable.

F. Underground Conductors: stranded, unless otherwise indicated.

G. Copper Bonding Conductors: As follows:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch (6.4 mm) in diameter.
2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.
4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.

H. Ground Conductor and Conductor Protector for Wood Poles: As follows:

1. No. 4 AWG minimum, soft-drawn copper conductor.
2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir, or cypress or cedar.

I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel.

1. Size: 3/4 by 120 inches (19 by 3000 mm) in diameter.

B. Chemical Electrodes: Copper tube, straight or L-shaped, filled with nonhazardous chemical salts, terminated with a 4/0 bare conductor. Provide backfill material recommended by manufacturer.

C. Test Wells: Provide handholes as specified in Section "Underground Ducts and Utility Structures."

PART 3 - EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.

F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch (25.4 mm) from wall and support from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.

2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.

G. Underground Grounding Conductors: Use tinned copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade or bury 12 inches (300 mm) above duct bank when installed as part of the duct bank.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:

1. Feeders and branch circuits.

2. Lighting circuits.

3. Receptacle circuits.

4. Single-phase motor and appliance branch circuits.

5. Three-phase motor and appliance branch circuits.

6. Flexible raceway runs.

7. Armored and metal-clad cable runs.

D. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

E. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.

F. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

G. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

H. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

I. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

J. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

K. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6.4-by-50-by-300-mm) grounding bus.

2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

L. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

3.3 INSTALLATION

A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.

2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

F. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

G. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

H. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, Paragraph 250-81(c), using a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within the base of the foundation. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.

F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
    a. Equipment Rated 500 kVA and Less: 10 ohms.
    b. Equipment Rated 500 to 1000 kVA: 5 ohms.
    c. Equipment Rated More Than 1000 kVA: 3 ohms.
    d. Substations and Pad-Mounted Switching Equipment: 5 ohms.
    e. Manhole Grounds: 10 ohms.
4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.6 GRADING AND PLANTING

A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Section "Landscaping." Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Specification sections, apply to work covered by this Section.

B. Comply with this sections, as applicable. Refer to other sections for coordination of work.

1.2 SCOPE OF WORK

A. Provide labor, material, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of supporting devices, including related systems and accessories.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Unistrut Corp.

B. B-Line Systems, Inc.

C. Midland Ross-Kindorf

2.2 MATERIALS

A. Suspension Hangers

1.1 Suspension hangers for individual conduit runs shall be zinc plated formed steel type.

B. Vertical Supports

1.1 Malleable iron one hole pipe straps shall be used for vertical runs.

C. Clamps

1.1 Beam clamps shall be used for bar joists and beams.

D. Anti-Vibration Hangers

1.1 Anti-vibration hangers shall be combination type having a double deflection neoprene element in series with a steel coil spring; double deflection of 0.30"; steel coil spring shall be selected from a 1" static deflection series with a minimum additional travel to solid of ½"; spring diameters shall be large enough to permit 15 degree angular misalignment of the rod connecting the hanger to the ceiling support without rubbing the hanger box.

2.3 Light Fixture Hangers

A. Refer to Section 16500

Corrosive Areas: PVC; at factory apply a minimum of 10-mil-thick PVC coating, bonded to metal, inside and outside.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hangers

1 Approved hangers and stiff leg supports shall be installed in quantity and size as required to carry the weight of raceway and contents and shall be arranged to prevent vibration transmission to the building and allow for raceway movement.

2 Hangers shall be supported by means of uncoated solid steel rods which are threaded to allow vertical adjustments. Lock nuts shall be provided in sufficient number and location to lock all rod adjustments permanently at the adjusted height. Two lock nuts shall be used unless the nut tightens against a threaded socket. Minimum rod diameters shall be as follows:

NOMINAL CONDUIT SIZE	ROD DIAMETER
1/2" through 2"	1/4"
2-1/2" through 3"	3/8"
4" and 5"	1/2"

3 Hanger spacing shall be as required for proper and adequate support raceway, but in no case shall be less than one hanger per 8'-0" of raceway length except that conduit less than 1" diameter shall be supported at least every 6'-0".

4 Where numerous conduits are run parallel to one another, they may be supported from a trapeze type hanger arrangement with strut bottom.

5 Anti-vibration type hangers shall be provided for equipment as required to minimize vibration and/or as directed by the Architect/Engineer.

B. Supports

1 Support of hangers shall be by means of sufficient quantities of individual after set steel expansion shields, or beam clamps attached to structural steel.

2 Stiff-legs shall be furnished and installed in cases where support from overhead structure is not possible.

3 Ceiling mounted lighting fixtures shall be supported from the building structure at two opposite corners. The Contractor shall provide fixture hangers to properly interface with the ceiling system.

4 Furnish and install complete any additional structural support steel, brackets, fasteners, etc., as required to adequately support all raceway and equipment.

5 Support of hangers from concrete slabs shall be by means of sufficient quantity of "U" brackets attached with after set expansion shields and bolts.

6 Support of hangers from concrete tees shall be by means of sufficient quantity of angle iron brackets attached with after set expansion shields and bolts.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1. Raceways include the following:
    a. RMC.
    b. IMC.
    c. PVC externally coated, rigid steel conduits.
    d. PVC externally coated, IMC.
    e. EMT.
    f. FMC.
    g. LFMC.
    h. LFNC.
    i. RNC.
    j. ENT.
    k. Wireways.
    l. Surface raceways.
2. Boxes, enclosures, and cabinets include the following:
    a. Device boxes.
    b. Floor boxes.
    c. Outlet boxes.
    d. Pull and junction boxes.
    e. Cabinets and hinged-cover enclosures.

B. Related Sections include the following:

1. Section "Basic Electrical Materials and Methods" for raceways and box supports.
2. Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. RMC: Rigid metal conduit.

H. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: Include layout drawings showing components and wiring for nonstandard boxes, enclosures, and cabinets.

1.5 QUALITY ASSURANCE

A. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

B. Comply with NECA's "Standard of Installation."

C. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Metal Conduit and Tubing:
    a. Alflex Corp.
    b. Anamet, Inc.; Anaconda Metal Hose.
    c. Anixter Brothers, Inc.
    d. Carol Cable Co., Inc.
    e. Cole-Flex Corp.
    f. Electri-Flex Co.
    g. Flexcon, Inc.; Coleman Cable Systems, Inc.
    h. Grinnell Co.; Allied Tube and Conduit Div.
    i. Monogram Co.; AFC.
    j. Spiraduct, Inc.
    k. Triangle PWC, Inc.
    l. Wheatland Tube Co.
2. Nonmetallic Conduit and Tubing:
    a. Anamet, Inc.; Anaconda Metal Hose.
    b. Arnco Corp.
    c. Breeze-Illinois, Inc.
    d. Cantex Industries; Harsco Corp.
    e. Certainteed Corp.; Pipe & Plastics Group.
    f. Cole-Flex Corp.
    g. Condux International; Electrical Products.
    h. Electri-Flex Co.

i. George-Ingraham Corp.
j. Hubbell, Inc.; Raco, Inc.
k. Lamson & Sessions; Carlon Electrical Products.
l. R&G Sloan Manufacturing Co., Inc.
m. Spiraduct, Inc.
n. Thomas & Betts Corp.

3. Conduit Bodies and Fittings:
   a. American Electric; Construction Materials Group.
   b. Crouse-Hinds; Div. of Cooper Industries.
   c. Emerson Electric Co.; Appleton Electric Co.
   d. Hubbell, Inc.; Killark Electric Manufacturing Co.
   e. Lamson & Sessions; Carlon Electrical Products.
   f. O-Z/Gedney; Unit of General Signal.
   g. Scott Fetzer Co.; Adalet-PLM.
   h. Spring City Electrical Manufacturing Co.
4. Metal Wireways:
   a. Hoffman Engineering Co.
   b. Keystone/Rees, Inc.
   c. Square D Co.

2.2 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.
B. Rigid Aluminum Conduit: ANSI C80.5.
C. IMC: ANSI C80.6.
D. EMT and Fittings: ANSI C80.3.
   1. Fittings: Set-screw type.
E. Fittings: NEMA FB 1; compatible with conduit/tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. RNC: NEMA TC 2, Schedule 40 or 80 PVC.
B. RNC Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.
C. LFNC: UL 1660.

2.4 METAL WIREWAYS

A. Material: Sheet metal sized and shaped as indicated.
B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
D. Wireway Covers: Screw – cover type flanged-and-gasketed type.
E. Finish: Manufacturer's standard enamel finish.

2.5 OUTLET AND DEVICE BOXES

A. Sheet Metal Boxes: NEMA OS 1.
B. Cast-Metal Boxes: NEMA FB 1, Type FD, cast box with gasketed cover.

2.6 PULL AND JUNCTION BOXES

A. Small Sheet Metal Boxes: NEMA OS 1.

B. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.7 ENCLOSURES AND CABINETS

A. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

B. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRING METHODS

A. Outdoors: Use the following wiring methods:

1. Exposed: Rigid steel.
2. Concealed: Rigid steel.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R .

B. Indoors: Use the following wiring methods:

1. Exposed: EMT.
2. Concealed: EMT.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC.
6. Damp or Wet Locations: Rigid steel conduit.
7. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
   a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

3.3 INSTALLATION

A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

B. Minimum Raceway Size: 3/4-inch trade size (DN21).

C. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.

D. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

E. Install raceways level and square and at proper elevations. Provide adequate headroom.

F. Complete raceway installation before starting conductor installation.

G. Support raceways as specified in Section "Basic Electrical Materials and Methods."

H. Use temporary closures to prevent foreign matter from entering raceways.

I. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

J. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

K. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.

L. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.

M. Raceways Embedded in Slabs (Must be indicated on drawings to be embedded. Please notify Engineer if required but not shown): Install in middle third of slab thickness where practical, and leave at least 1-inch (25-mm) concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Run conduit larger than 1-inch trade size (DN27) parallel to or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.

N. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.

1. Run parallel or banked raceways together, on common supports where practical.
2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

O. Join raceways with fittings designed and approved for the purpose and make joints tight.

1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
2. Use insulating bushings to protect conductors.

P. Tighten set screws of threadless fittings with suitable tools.

Q. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.

R. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

S. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of the pull wire.

T. Telephone and Signal System Raceways, 2-Inch Trade Size (DN53) and Smaller: In addition to the above requirements, install raceways in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

U. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as the boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

V. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded flush plugs flush with floor for future equipment connections.

W. Flexible Connections: Use maximum of 6 feet (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.

X. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in a nonmetallic sleeve.

Y. Do not install aluminum conduits embedded in or in contact with concrete.

Z. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

AA. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying the raceways to receptacle or fixture ground terminals.

1. Select each surface raceway outlet box, to which a lighting fixture is attached, of sufficient diameter to provide a seat for the fixture canopy.
2. Where a surface raceway is used to supply a fluorescent lighting fixture having central-stem suspension with a backplate and a canopy (with or without extension ring), no separate outlet box is required.
3. Provide surface metal raceway outlet box, and the backplate and canopy, at the feed-in location of each fluorescent lighting fixture having end-stem suspension.
4. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed, no additional surface-mounted outlet box is required. Provide a backplate slightly smaller than the fixture canopy.

BB. Set floor boxes level and adjust to finished floor surface.

CC. Set floor boxes level and trim after installation to fit flush to finished floor surface.

DD. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

EE. NO PVC CONDUIT ALLOWED ABOVE THE CEILING OR IN THE A/C RETURN PLENUM. PROVIDE RIGID CONDUIT. Verify all MEP documents.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.5 CLEANING

A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION

PART 1 GENERAL

1.1RELATED REQUIREMENTS

The General Provisions, Supplemental General Provisions, Special Provisions and Specification sections, apply to work covered by this Section.

Comply with ELECTRICAL Sections, as applicable. Refer to other sections for coordination of work.

1.2SCOPE OF WORK

A.Provide labor, material, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of electrical identification, including related accessories.

B.Provide electrical identification for the following:

Panelboards, motor starters, contactors, disconnect switches, circuit breakers and other electrical equipment with nameplate identifying the item of equipment and the equipment serving the same.

Raceways, junction boxes and pull boxes.

Label each panelboard index indicating the room #s to the related circuit. Also add the index sheet in a laminated white core, plastic with beveled edges, minimum 1/16 inch thick. Lettering shall be machine-engraved, not less than 1/4" high, cut through the black or red surface to the white core.

Wiring devices.

Wiring.

Three phase motor rotation.

1.3 SUBMITTALS

A. Submit product data in accordance with Section for products specified under.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Brady
Panduit
Thomas & Betts
Seton

2.2 IDENTIFICATION

2.3 A. Nameplates

Nameplates shall be black engraved surface on white core for normal power circuits and red engraved surface on white core for emergency power circuits.

Provide for each distribution panelboard, branch circuit panelboard, transformer and any other similar equipment furnished under this section identification as to its given name, voltage and origination of service. Examples are as follows:

‘LR1’	‘LR2’
120/240V	120/240V
FED FROM ‘MDP’	FED FROM ‘MDP’

Provide for each motor starter enclosure, circuit breaker enclosure, disconnect switch and any other similar equipment furnished under this section, identification as to the specific load that it serves and the origination of service. Examples are as follows:

‘AHU-1'	‘CU-1'
FED FROM ‘MDP'	FED FROM ‘MDP’

Provide for each feeder protective device in each distribution panelboard and any other similar equipment furnished under this section, identification as to the specific load that it serves. Nameplates shall be laminated, white core, plastic with beveled edges, minimum 1/16 inch thick.

Lettering shall be machine-engraved, not less than 1/4" high, cut through the black or red surface to the white core.Junction Boxes and Pull Boxes

Identification shall be with a black permanent marking pen on the top of 4" x 4" junction box covers or on the back of an outlet box cover plate identifying the branch circuits and systems within the conduit. Pull boxes shall be provided with a nameplate stating voltage and system served.

Wiring Device Wall Plates

On the back side of wiring device wall plates identify with a black permanent marking pen the panelboard and branch circuit number the device is served from.

Wire Markers

Wire markers for identification of wiring shall be self-adhesive type having letters and numerals indicating serving equipment and feeder or branch circuit number.

Rotation Tags

Rotation tags shall be brass or aluminum securely attached to equipment.

PART 3 EXECUTION

PREPARATION

Surfaces to receive labels or nameplates shall be carefully prepared in accordance with the manufacturer's instructions and recommendations.

NAMEPLATES

Nameplates shall be properly attached to identify panelboards, feeder circuit breakers, disconnect switches, pull boxes and other similar equipment furnished under this section.

WIRE MARKERS

Wire markers shall be applied to each conductor or cable within panelboards, motor starter enclosures, circuit breaker enclosures, disconnect switches, cabinets, junction boxes, pull boxes, and other similar equipment identifying the serving equipment and feeder or branch circuit from which the conductors originate.

END OF SECTION

SECTION 26 05 73 SHORT-CIRCUIT/COORDINATION STUDY/ARC FLASH HAZARD ANALYSIS

PART 1 **GENERAL**

1.01 SCOPE

A. The contractor shall furnish short-circuit and protective device coordination studies which shall be prepared by the equipment manufacturer.

B. The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace, reference Article 130.5 and Informative Annex D.

C. Related sections

1. Section 16016 – Arc Flash Hazard Analysis Study

1.02 REFERENCES

A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

1. IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
2. IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
3. IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis
4. IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings
5. IEEE 1015 – Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems
6. IEEE 1584 – Guide for Performing Arc-Flash Hazard Calculations

B. American National Standards Institute (ANSI):

1. ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
2. ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures
3. ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
4. ANSI C 37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories
5. ANSI C37.5 – Methods for Determining the RMS Value of a Sinusoidal Current Wave and Normal-Frequency Recovery Voltage, and for Simplified Calculation of Fault Currents

C. The National Fire Protection Association (NFPA)

1. NFPA 70 - National Electrical Code, latest edition
2. NFPA 70E – Standard for Electrical Safety in the Workplace

1.03 SUBMITTALS FOR REVIEW/APPROVAL

A. The short-circuit and protective device coordination studies shall be submitted to the design engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the studies may cause delay in equipment manufacturing, approval from the engineer may be obtained for preliminary submittal of sufficient study data to ensure that the selection of device and characteristics will be satisfactory.

1.04 SUBMITTALS FOR CONSTRUCTION

A. The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report. No more than five (5) bound copies of the complete final report shall be submitted. For large system studies, submittals requiring more than five (5) copies of the report will be provided without the section containing the computer printout of the short-circuit input and output data. Additional copies, where required, shall be provided on CD in PDF format.

B. The report shall include the following sections:

1. One-line diagram showing protective device ampere ratings and associated designations, cable size & lengths, transformer kVA & voltage ratings, motor & generator kVA ratings, and switchgear/switchboard/panelboard designations
2. Descriptions, purpose, basis and scope of the study
3. Tabulations of the worst-case calculated short circuit duties as a percentage of the applied device rating (automatic transfer switches, circuit breakers, fuses, etc.); the short circuit duties shall be upward-adjusted for X/R ratios that are above the device design ratings
4. Protective device time versus current coordination curves with associated one line diagram identifying the plotted devices, tabulations of ANSI protective relay functions and adjustable circuit breaker trip unit settings
5. Multi-function relay setting file printouts including all ANSI protective relay functions and associated logic and control. Metering, communication, and control logic settings not associated with ANSI protective functions are not required.
6. Fault study input data, case descriptions, and current calculations including a definition of terms and guide for interpretation of the computer printout
7. Incident energy and flash protection boundary calculations
8. Comments and recommendations for system improvements, where needed
9. Executive Summary including source of information and assumptions made

1.05 QUALIFICATIONS

A. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the supervision and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies. The Registered Professional Electrical Engineer shall be a full-time employee of the Engineering Services Organization.

PART 2 **PRODUCT**

2.01 STUDIES

A. Contractor to furnish short-circuit and protective device coordination studies as prepared by equipment manufacturer. By using the equipment manufacturer the study allows coordination of proper breakers, fuses, and current transformers. The coordination study shall begin with the utility company's feeder protective device and include all of the electrical protective devices down to and include the largest feeder circuit breaker and motor starter in the 480 Volt motor control centers and power distribution panelboards. The study shall also include variable frequency drives, harmonic filters, power factor correction equipment, transformers and protective devices associated with variable frequency drives, emergency and standby generators associated paralleling equipment and distribution switchgear.

B. The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace, reference Article 130.5 and Informative Annex D.

2.02 DATA COLLECTION

A. Contractor shall furnish all field data as required by the power system studies. The Engineer performing the short-circuit, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to eliminate unnecessary delays and assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.

B. Source combination may include present and future utility supplies, motors, and generators.

C. Load data utilized may include existing and proposed loads obtained from Contract Documents provided by Owner or Contractor.

D. Include fault contribution of existing motors in the study, with motors < 50 hp grouped together. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.03 SHORT-CIRCUIT AND PROTECTIVE DEVICE EVALUATION STUDY

A. Use actual conductor impedances if known. If unknown, use typical conductor impedances based on IEEE Standards 141, latest edition.

B. Transformer design impedances and standard X/R ratios shall be used when test values are not available.

C. Provide the following:

1. Calculation methods and assumptions
2. Selected base per unit quantities
3. One-line diagram of the system being evaluated with available fault at each bus, and interrupting rating of devices noted
4. Source impedance data, including electric utility system and motor fault contribution characteristics
5. Typical calculations
6. Tabulations of calculated quantities
7. Results, conclusions, and recommendations

D. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each:
   1. Electric utility's supply termination point
   2. Incoming switchgear
   3. Unit substation primary and secondary terminals
   4. Low voltage switchgear
   5. Motor control centers
   6. Standby generators and automatic transfer switches
   7. Branch circuit panelboards
   8. Other significant locations throughout the system

E. For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.

F. Protective Device Evaluation:
   1. Evaluate equipment and protective devices and compare to short circuit ratings
   2. Adequacy of switchgear, motor control centers, and panelboard bus bracing to withstand short-circuit stresses
   3. Adequacy of transformer windings to withstand short-circuit stresses
   4. Cable and busway sizes for ability to withstand short-circuit heating
   5. Notify Owner in writing, of existing, circuit protective devices improperly rated for the calculated available fault current

2.04 PROTECTIVE DEVICE COORDINATION STUDY

A. Proposed protective device coordination time-current curves shall be graphically displayed on log-log scale paper.

B. Include on each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered.

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.

D. Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

E. Plot the following characteristics on the curve sheets, where applicable:
   1. Electric utility's protective device
   2. Medium voltage equipment relays
   3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
   4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands
   5. Transformer full-load current, magnetizing inrush current, and ANSI transformer withstand parameters
   6. Conductor damage curves

7. Ground fault protective devices, as applicable
8. Pertinent motor starting characteristics and motor damage points
9. Pertinent generator short-circuit decrement curve and generator damage point
10. Other system load protective devices for the largest branch circuit and the largest feeder circuit breaker in each motor control center

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

G. Select each primary protective device required for a delta-wye connected transformer so that the characteristics or operating band is within the transformer parameters which includes a parameter equivalent to 58% of the ANSI withstand point to afford protection for secondary line-to-ground faults.

H. Separate low voltage power circuit breakers from each other and the associated primary protective device by a 16% current margin for coordination and protection in the event of secondary line-to-line faults.

I. Engineer shall provide settings file printouts for all multifunction relays supplied under this contract including all ANSI protective relay functions and associated logic and control. Metering, communication, and control logic settings not associated with ANSI protective functions are not required.

2.05 ARC FLASH HAZARD ANALYSIS

A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2012, Informative Annex D.

B. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Alternative methods shall be presented in the proposal.

C. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.

D. The Arc-Flash Hazard Analysis shall include all MV, 575v, & 480v locations and significant locations in 240 volt and 208 volt systems fed from transformers equal to or greater than 125 kVA.

E. Safe working distances shall be specified for calculated fault locations based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm^2.

F. The Arc Flash Hazard analysis shall include calculations for maximum and minimum contributions of fault current magnitude. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume a minimum motor load. Conversely, the maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

G. Arc flash computation shall include both line and load side of main breaker calculations, where necessary.

H. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 section B.1.2.

2.06 REPORT SECTIONS

A. Input Data:

1. Utility three-phase and line-to-ground available contribution with associated X/R ratios
2. Short-circuit reactance of rotating machines with associated X/R ratios
3. Cable type, construction, size, # per phase, length, impedance and conduit type
4. Bus duct type, size, length, and impedance
5. Transformer primary & secondary voltages, winding configurations, kVA rating, impedance, and X/R ratio
6. Reactor inductance and continuous ampere rating
7. Aerial line type, construction, conductor spacing, size, # per phase, and length

B. Short-Circuit Data:

1. Source fault impedance and generator contributions
2. X to R ratios
3. Asymmetry factors
4. Motor contributions
5. Short circuit kVA
6. Symmetrical and asymmetrical fault currents

C. Recommended Protective Device Settings:

1. Phase and Ground Relays:
   a. Current transformer ratio.
   b. Current setting.
   c. Time setting.
   d. Instantaneous setting.
   e. Specialty non-overcurrent device settings.
   f. Recommendations on improved relaying systems, if applicable.
2. Circuit Breakers:
   a. Adjustable pickups and time delays (long time, short time, ground).
   b. Adjustable time-current characteristic.
   c. Adjustable instantaneous pickup.
   d. Recommendations on improved trip systems, if applicable.

D. Incident energy and arc flash boundary calculations.

1. Arcing fault magnitude
2. Device clearing time
3. Duration of arc
4. Arc flash boundary
5. Working distance
6. Incident energy
7. Recommendations for arc flash energy reduction

PART 3 **EXECUTION**

3.01 FIELD ADJUSTMENT

A. Adjust relay and protective device settings according to the recommended settings table provided by the coordination study. Field adjustments to be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

B. Make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

C. Notify Owner in writing of any required major equipment modifications.

D. Following completion of all studies, acceptance testing and startup by the field engineering service division of the equipment manufacturer, a 2-year warranty shall be provided on all components manufactured by the engineering service parent manufacturing company.

3.02 ARC FLASH WARNING LABELS

A. The vendor shall provide a 4 in. x 4 in. thermal transfer type label of high adhesion polyester for each work location analyzed.

B. The label shall have an orange header with the wording, “WARNING, SHOCK & ARC FLASH HAZARD”, and shall include the following information:

1. Location designation
2. Nominal voltage
3. Arc flash boundary
4. Incident energy
5. Working distance
6. Shock Boundaries
7. Engineering report number, revision number and issue date

C. Labels shall be machine printed, with no field markings

D. Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings.

1. For each 600, 480 and applicable 208 volt panelboards and disconnects, one arc flash label shall be provided
2. For each motor control center, one arc flash label shall be provided
3. For each low voltage switchboard, one arc flash label shall be provided
4. For each switchgear, one flash label shall be provided
5. For medium voltage switches one arc flash label shall be provided

E. Labels shall be field installed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

3.03 ARC FLASH TRAINING

A. The equipment vendor shall train personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). Maintenance procedures in

accordance with the requirements of NFPA 70E, Standard For Electrical Safety Requirements For Employee Workplaces, shall be provided in the equipment manuals. The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET).

END OF SECTION

PART 1 –GENERAL

1.1 SUMMARY

A. The work covered in this section is subject to all of the requirements in the General Conditions of the Specifications. Contractor shall coordinate all of the work in this section with all of the trades covered in other sections of the specification to provide a complete and operable system. All Labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section.

B. **Contractor shall include all cost for a manufacturer certified technician to provide a complete training session to owner representatives. Training shall include but not limited to the following: programming existing and how to add new circuits, trouble shooting, overview of panel and any request from owner. Training may take days; contractor/manufacturer shall include all cost in bid. Contractor shall notify owner/Architect/Engineer on the day for the training.**

1.2 DESCRIPTION OF WORK

A. Furnish and install a complete system for the control of lighting and other equipment as indicated on the plans, detailed in the manufacturer submittal and as further defined herein. Contractor is solely responsible to verify quantity, installation locations and wiring requirements for this project. Specific manufacturer's catalog numbers, when listed in this section are for reference only. It is the responsibility of the contractor to verify with lighting control manufacturer all catalog information and specific product acceptability.

B. The system shall include but not be limited by the following list: Pre-wired, microprocessor controlled relay or dimming panels with latching relays controlled via a complete list of communication based accessories including digital switches, digital photocells, digital SmartBreaker panelboards, Digital Time Clock (DTC) and interface cards to dimming systems, building automation systems, thermostats, and other devices. The type of lighting control equipment and wiring specified in this section is covered by the description: Microprocessor Controlled Digital Lighting Control system with RS 485 Bus communications. Requirements are indicated elsewhere in these specifications for work including, but not limited to, raceways and electrical boxes and fittings required for installation of control equipment and wiring. They are not the work of this section.

C. SmartBreaker panel boards shall operate as if each breaker were a relay in the lighting control system. All references in this spec to the operation of relays shall apply equally to the solenoid operated thermal magnetic breakers within SmartBreaker panel boards.

1.3 SUBMITTALS

A. Shop Drawings: Submit dimensioned drawings of lighting control system and accessories including, but not necessarily limited to, relay panels, switches, DTC, photocells and other interfaces. Shop drawings shall indicate exact location of each device or a RFI to confirm location. Plans are diagrammatical. EC to verify all lighting control material requirements from approved shop drawings. "Cut Sheet" submittal not acceptable.

B. Product Data: Submit for approval manufacturer's data on the specific lighting control system and components. Submittal shall be electronic format with hard copy available. To prevent departures from approved system operation, electronic files submitted shall

be able to be directly downloaded to the specified system at manufacturer facility. Submit a complete bill of materials with part numbers, description and voltage specifications.

D. Manufacturer shall provide free software that can be used to specify the system, detail all programming and generate a single line in a format that can be dropped into industry standard CAD packages.

E. One Line Diagram: Submit a one-line diagram of the system configuration indicating the type, size and number of conductors between each component if it differs from that illustrated in the riser diagram in these specifications. Submittals that show typical riser diagrams are not acceptable.

1.4 QUALITY ASSURANCE

A. Products shall be manufactured by Lighting Control & Design, Los Angeles, CA, 800.345.4448 or approved equal. Such firms shall be regularly engaged in manufacturing of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years. Any product other than those listed in this specification must be pre-approved a minimum of two weeks before bid time. No exceptions.

B. Control wiring shall be in accordance with the NEC requirements for Class 2 remote control systems, Article 725 and manufacturer specification.

C. A licensed electrician shall functionally test each system component after installation, verify proper operation and confirm that all relay and dimming panels and switch wiring conform to the wiring documentation. The Electrical Contractor (EC) is required to phone LC&D a minimum of 7 days before turnover for system checkout. At time of LC&D contact, all components including phone line to modem must be installed, powered and operational.

D. Comply with NEC and all local and state codes as applicable to electrical wiring work.

E. Lighting control panels shall be UL 916 Listed. LCPs controlling emergency circuits shall be ETL listed to UL 924. Relay panels shall also be listed to comply with CSA C22.2#205 Emergency source circuits controlled in normal operation by a relay panel shall fully comply with NEC 700-9(b). Electrical contractor is responsible for verifying compliance.

F. The lighting control system shall be listed, approved and comply as required with all national, state and local energy codes to include but not limited to California Title 24 and ASHRAE 90.1-2004.

1.5 MAINTENANCE MATERIALS

A. Division 1 - Execution Requirements: Spare parts and maintenance products.
B. Provide 10% spare relays per LCP, up to the maximum capacity of the LCP.
C. Provide CD version of manufacturers operating software to include graphical interface software.
D. Provide 2 extra sets of as-built and operating manuals.

1.6 SUBSTITUTIONS

A. Substitutions are permitted as voluntary alternates. Base bid must reflect the specified equipment.

B. A product must go through the following process before being approved as a substitution:
1. A list of substitutions shall be provided to the owner as an attachment to the bid form. Submit along with bill of material, CD of proposed operating system, and a

one line diagram of the system configuration proposed indicating the type, size and number of conductors between each component if it differs from that illustrated in the riser diagram or in these specifications.

2. The list will be reviewed by the owner and the engineer to determine whether the equipment meet the project needs. A $500 retainer will be submitted with the list of voluntary alternates to cover this meeting. If the owner and engineer agree that this meeting is not required, then the $500 will be returned to the contractor.
3. The retainer is for evaluation of the alternate. The retainer is to be used to cover the time spent in this evaluation. The fee will be collected based on time spent in evaluation, not on whether the alternate is accepted. All unused portions will be returned to the contractor with an invoice marked “paid” by the engineer, architect, and/or owner.

1.7 SYSTEM DESCRIPTION

A. The lighting control system is a networked system that communicates via RS485. The system must be able to communicate with fully digital centralized relay panels, small distributed relay panels (Available with 0-10VDC dimming outputs), (also called Micro Panels), Fully distributed fixture level control by bus connected relays or dimmers, (also called X-Point) smart breaker panels, digital switches, photocells, various interfaces and operational software. The intent of the specification is to integrate all lighting control into one system. Distributed lighting control shall be provided using networked micro relay panels or bus connected fixture level control (X Point.) Lighting control system shall include all hardware and software. Software shall be resident within the lighting control system. System shall provide local access to all programming functions at the master LCP and remote access to all programming functions via dial up modem and through any standard computer workstation. Lighting control system shall have the capability to be remotely controlled via the internet or building wide Ethernet LAN. Desktop computers are not part of this section and will be provided by others. Include all software for remote access and graphics.

B. System software shall provide real time status of each relay, each zone and each group.

C. Lighting control system shall be able to be monitored by and take commands from a remote PC. At any time, should the remote PC go off-line all system programming uploaded to the lighting control system shall continue to operate as intended. Systems requiring an on line PC or server for normal operation are not acceptable

D. All devices shall be pre-addressed at the factory. If required by the client the system may be specified without pre-addressing and simple software is to be provided to simplify addressing in place. This particularly applies to fixture level control where controls may be factory mounted on the fixture in advance to speed installation.

E. All programs, schedules, time of day, etc, shall be held in non-volatile memory for an indefinite time exceeding 10 years in the event of power failure. At restoration of power, lighting control system shall implement programs required by current time and date. Time of day shall be battery backed for at least 10 years.

F. System shall be capable of warning of an impending off sweep by flashing lights Off/On once or twice (programmable) by relay or by zone prior to the lights being turned off. The warning interval times between the flash and the final lights off signal shall be definable for each zone. Additionally an audible signal shall be able to be programmed that gives a mild note on the first flash and a more insistent signal on the second one. Occupant shall be able to override any scheduled Off sweep using local wall switches within the occupied space. Occupant override time shall be locally and remotely programmable and not exceed 2-hours.

G. The system shall be capable of implementing On commands, Off commands, Raise (dimming) commands, Lower (dimming) commands for any relay, group or zone by

means of digital wall switches, contact closure switches, time clock schedules including offsets from dusk and dawn by up to 10 hours, photocell, pc software or other devices connected to programmable inputs in a lighting control panel.

H. The lighting control system shall provide the ability to control each relay and each relay group per this specifications requirement. All programming and scheduling shall be able to be done locally at the master LCP and remotely via dial up modem and via the Internet. Remote connection to the lighting control system shall provide real time control and real time feedback.

I. Micro relay panels shall be capable of taking inputs from contact closure switches and outputting up to 8 independent 0-10VDC dimming signals. All micro relay panels and all devices connected to micro relay panels (switches, photocells and occupancy sensors, etc) shall be wired per lighting control manufacturers instructions.

J. X Point relay or dimming modules shall be fed from an X Point router that sits on the GR 2400 Bus in the manner of a relay panel. Individual modules are fed from this panel on a separate bus. Each router may feed two strings of up to 64 modules on a 2000ft string. Each Module may be a single relay, a dual relay or a dimming (0-10Volt) module. Relays in the modules are to be capable of being separately controlled in the same manner as an individual relay or dimmer in a relay or dimmer panel. Additionally multiple relays may be collected together to act together as a single multi-pole load or dimmer for ease of programming. Graphical software shall be available that does these assignments and reassignments in a straightforward and logical manner. Relays shall have the same specifications as laid out in 2.1.C. Modules with reduced current ratings may be supplied with Quick Connect connectors for more rapid installation.

PART 2 -PRODUCTS

2.1 MATERIAL AND COMPONENTS

A. Relay Panels:

1. All LCP's shall be in NEMA 1 rated enclosure with screw cover or hinged door. Other NEMA rated types optional.
2. A barrier shall separate the high voltage and low voltage compartments of the panel and separate 120VAC and 277VAC.
3. LCP input power shall be capable of accepting 120VAC or 277VAC without rewiring or 120VAC or 347VAC for Canadian applications.
4. Control electronics in the low voltage section shall be capable of driving 2 to 48, latching relays per section 2.1.C, control any individual or group of relays, provide individual relay overrides, provide a master override for each panel, store all programming in non-volatile memory, after power is restored return system to the correct state for time of day, provide programmable dual blink warn timers for each relay or zone of relays, and be able to control Normally Open Latching (NOL) or Normally Closed Latching (NCL) relays.
5. Lighting control system shall be digital and consist of a Master LCP, Remote LCPs, Micro LCPs with up to 8 individual relays, X Point Router and associated relays or dimmers emulating standard or Micro LCPs, digital switches, digital interface cards and if required, SmartBreaker panelboards. All system components shall connect and be controlled via Category 5, 4 twisted pair cable with RJ45 connectors, providing real time two-way communication with each system component. All Micro LCP's shall provide multiple inputs for photocells and occupancy sensors. Analog systems are not acceptable.

B. Micro Relay Panels

1. Micro relay panels shall have from 2 to 8 latching relays per section 2.1.C and shall control all lighting in the designated area indicated on the plans and be part of the lighting control network. Each micro relay panel shall provide minimum 300ma at 12/24VDC for powering occupancy sensors. Micro relay panels that require a separate occupancy sensor power pack are not acceptable.
2. Micro relay panel shall provide a minimum of 4-programmable photocell inputs, a minimum of 8-programmable occupancy sensor contact closure inputs. This requirement is to insure integration of entire lighting system into one networked, lighting control system.
3. Micro relay panels shall be capable of outputting minimum 4 and up to 8 independent 0-10VDC dimming signals, one independent dimming signal for each of 8 relays. In order to maximize daylight harvesting and minimize disruption to occupants, each dimming output shall provide adjustment for baseline, start point, mid point, end point, trim, fade up rate, fade down rate, time delay and enable/disable masking. All photocell settings must be remotely accessible. Systems providing On, Off with Time Delay only, and system that do not provide remote access are not acceptable.
4. MicroPanels shall have built in capability to take commands from a fully compatible wireless switch. Wireless switch shall contain no battery; have 32-bit unique ID and a minimum 90-foot range line of sight.

C. Standard Output relays
1. UL Listed 30A @277VAC Ballast and HID, 20A Tungsten at 120VAC and 347VAC Ballast and HID at 20A Latching Relay with 18,000A SCCR @277VAC.
2. Relays shall be individually replaceable. Relay terminal blocks shall be capable of accepting two (2) #8AWG wires on both the line and the load side. Systems that do not allow for individual relay replacement or additions are not acceptable. Relays to be rated for 250,000 operations minimum at a full 30A lighting load. Standard relay shall default to closed at normal power loss, Normally Closed Latching (NCL).
3. Optional relay types available shall include: Normally Open Latching (NOL) relay rated for 250,000 operations, a 600VAC 2-pole NO or NC, and a Single Pole, Double Throw (SPDT) relay.

D. Low Voltage Switches

1. All switches shall be digital and communicate via RS 485. Contact closure style switches, except as specified for connection to the micro relay panel programmable contact closure inputs, shall not be acceptable. The programming for a digital switch shall reside in the switch itself, via double EPROM memory. Any digital switch button function shall be able to be changed locally (at the DTC or a PC) or remotely, via modem, Internet or Ethernet.
2. Digital low voltage switch shall be a device that sits on the lighting control system bus. Digital switch shall connect to the system bus using the same cable and connection method required for relay panels. Each button shall be capable of being programmed for On only, Off only, Mix (Some on some off), On/Off (toggle), Raise (Dim up) and Lower (Dim down). Further each button shall be able to be enabled or disabled over the bus. An audible alarm shall be available on all switches that can be programmed to beep on button push or with warning light blinks.
3. Keyed switches shall be similarly programmable and connect to the lighting control system bus.
4. Digital switches for high abuse areas (common areas, gymnasiums, etc.) shall be vandal resistant, contain no moving parts, and be touch sensitive and available with up to two buttons in a single gang. Multi gang versions shall also be available. Touch pads shall be Stainless Steel and capable of handling both high abuse and wash down locations. High abuse switches shall connect to the lighting control system digital bus. Each high abuse touch button shall be able to be programmed in the same way as other digital switch buttons. Switches must

be capable of handling electrostatic discharges of at least 30,000 volts (1cmspark) without any interruption or failure in operation.

E. Wireless Switches-System shall have the capability to accept in inputs from 32-bit unique ID wireless switches. Wireless switches shall have no battery and be capable of On, Off, Raise and Lower commands. Wireless switches shall have a minimum 90 foot line of sight range

F. DTC - Digital Electronic Time Clock
1. A Digital Time Clock (DTC) shall control and program the entire lighting control system and supply all time functions and accept modem (RS232) inputs.
2. DTC shall be capable of up to 32 schedules. Each schedule shall consist of one set of On and Off times per day for each day of the week and for each of two holiday lists. The schedules shall apply to any individual relay or group of relays.
3. The DTC shall be capable of controlling digital devices at up to 127 addresses on a single bus and capable of interfacing digitally with other buses using manufacturer supplied interface cards.
4. The DTC shall accept control locally using built in button prompts and use of an 8 line 21-space display or from a computer or modem via an on-board RS 232 port. All commands shall be in plain English. The DTC shall be run from non-volatile memory so that all system programming is retained indefinitely and time of day is battery backed for up to 10 years.
5. Unity™ lighting control software shall provide via local or remote PC a visual representation of each device on the bus, show real time status and the ability to change the status of any individual device, relay or zone. System shall be capable of running optional Unity GX lighting control software. Unity GX shall provide for importing vector based graphics and a simple interface that allows users or a factory programmer to overlay color “controls” that are associated with relays or collections of relays. Clicking on the overlays changes the color and the status of the relays for visual display of large systems.
6. System shall come with a pre-Installed modem that allows for remote programming from any location using a PC and free remote control software.
7. DTC shall provide system wide timed overrides. Any relay, group or zone that is overridden ON, before or after hours, shall automatically be swept OFF by the DTC a maximum of 2 hours later.

G. PHOTOCELL: Photocells to be mounted in location indicated on the plans. Photocells used for exterior lights shall provide multiple trip points from 1 roof mounted unit. All trip points shall be able to be changed remotely via Internet or dial up modem. Photocells requiring manual trip point adjustment are not acceptable. Photocell used for interior lighting control shall have multiple settings such as start-point, mid-point, off-point, fade-up, fade-down, etc. All settings shall be remotely accessible and adjustable. Systems providing local adjustment only are not acceptable. Photocells to be certified to comply with the current energy code covering this project at time of submittal of plans for building permit.

H. Interfaces: For future expansion capability, systems are to have available all of the following interfaces. Verify and install only those interfaces indicated on the plans.
1. A dry contact input interface card that provides 14 programmable dry contact closure inputs. Use shielded cable to connect input devices to interface card on runs over 200ft.
2. Uplink Interface card that allows a single bus to be part of a greater system connected together by a Back Bone Bus. The back Bone bus requires a server for the Modem and Ethernet connections to such a large system.
3. An interface card (T-LINK) that allows the DTC to control up to 32 digital XCI brand thermostats. Programming of thermostats is to be capable of being done locally (at the DTC) or remotely, via modem, Internet or Ethernet.

4. When Unity GX software is specified full graphic pages shall be designed to the owner's specifications. Owner is to provide to manufacturer all necessary files and criteria. Provide ____ GX pages.
5. Direct digital interface to SmartBreaker panelboards. Relay panel and SmartBreaker panelboard circuits shall appear on the system software as similar, yet distinct, items and maintain all functions and features of the system software.
6. Direct digital interface to DMX 512 based systems. DMX interface shall provide 14 global commands, each of which can be modified locally or remotely using lighting controls manufacturer supplied software. DMX interface shall be integral to the system bus and shall connect and be controlled via a single Category 5, 4 twisted pair cable, providing real time response from the lighting control system to DMX commands.
8. Direct digital interface to building automation systems using DDC protocols such as BACnet, Metasys (N2) and ModBus that accept on/off commands, time schedules and report status of all relays in all panels in real time. Interface cards shall "self populate" each individual relay and each group to the BAS. All BAS system programming required shall be the responsibility of the BAS system provider.

PART 3 -EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Mount relay control cabinets adjacent to respective lighting panel board. Cabinet shall be surface or flush mount, per plans. Wiring between relay control cabinets and panelboards shall be in accordance with local codes and acceptable industry standards. Under no circumstances will any extra payment be authorized for the EC or GC due to the EC's lack of knowledge or understanding of any and all prevailing codes or specified manufacturer's installation requirements. Neatly lace and rack wiring in cabinets. During construction process, protect all interior components of each relay panel and each digital switch from dust and debris. Any damage done to electronic components due to failure to protect them shall be the sole responsibility of the installing contractor.

B. Switches: Provide outlet boxes, single or multi-gang, as shown on the plans for the low voltage digital switches. Mount switches as per plans. Supply faceplates per plans and specifications. EC is specifically responsible to supply and install the required low voltage cable, Category 5, 4 twisted pair, with RJ45 connectors (commonly referred to as Cat 5 patch cable) between all switches and panels. Field-test all Cat 5 patch cable with a recognized cable tester. All low voltage wire to be run in conduit, per local codes.

C. Manufacturer to provide on all systems of more than 2 panels a crimping kit with sufficient approved EZ Brand RJ 45 connectors to populate the whole system. A simple manual that shows all the pitfalls of crimping RJ 45s and how to do it right must be both provided and read by the installing contractor.

D. Wiring
1. Do not mix low voltage and high voltage conductors in the same conduit. No exceptions.
2. Ensure low voltage conduits or control wires do not run parallel to current carrying conduits.
3. Place manufacturer supplied "terminators" at each end of the system bus per manufacturer's instructions.
4. Plug in Category 5 patch cable with RJ45 end connector that has been field-tested with a recognized cable tester, at the indicated RJ45 connector provided at each lighting control device, per manufacturer's instructions.
5. Use Category 5 patch cable for all system low voltage connections. Additional conductors may be required to compensate for voltage drop with specific system

designs. Contact LC&D or refer to the GR2400 manual for further information. Use shielded cable for dry contact inputs on runs over 200ft.

6. Do not exceed 4000ft-wire length for the system bus.
7. All items on the bus shall be connected in sequence (daisy chained). Star and spur topologies are not acceptable.
8. The specified lighting control system shall be installed by the electrical contractor who shall make all necessary wiring connections to external devices and equipment, to include photocell. EC to wire per manufacturer instructions.

3.2 INSTALLATION AND SET-UP

A. Verify that conduit for line voltage wires enters panel in line voltage areas and conduit for low-voltage control wires enters panel in low-voltage areas. Refer to manufacturer's plans and approved shop drawings for location of line and low-voltage areas. This is especially applicable in jobs where back boxes are sipped in advance. It is the responsibility of the contractor to verify with lighting control manufacturer all catalog information and specific product acceptability.

B. For approved contact closure switches, use #18 AWG stranded conductors. For all other digital switches, provide wiring required by system manufacturer.

C. For classroom digital switches provide wiring required by system manufacturer

D. Contractor to test all low voltage cable for integrity and proper operation prior to turn over. Verify with system manufacturer all wiring and testing requirements.

E. Before Substantial Completion, arrange and provide a one-day Owner instruction period to designated Owner personnel. Set-up, commissioning of the lighting control system and Owner instruction includes:

1. Confirmation of entire system operation and communication to each device.
2. Confirmation of operation of individual relays, switches, occupancy sensors and daylight sensors
3. Confirmation of system Programming, photocell settings, override settings, etc.
4. Provide training to cover installation, maintenance, troubleshooting, programming, and repair and operation of the lighting control system.

F. Panels shall be located so that they are readily accessible and not exposed to physical damage.

G. Panel locations shall be furnished with sufficient working space around panels to comply with the National Electric Electrical Code.

H. Panels shall be securely fastened to the mounting surface by at least 4 points.

I. Unused openings in the cabinet shall be effectively closed.

J. Cabinets shall be grounded as specified in the National Electrical Code.

K. Lugs shall be suitable and listed for installation with the conductor being connected.

L. Conductor lengths shall be maintained to a minimum within the wiring gutter space. Conductors shall be long enough to reach the terminal location in a manner that avoids strain on the connecting lugs.

M. Maintain the required bending radius of conductors inside cabinets.

N. Clean cabinets of foreign material such as cement, plaster and paint.

O. Distribute and arrange conductors neatly in the wiring gutters.

P. Follow the manufacturer's torque values to tighten lugs.

Q. Before energizing the panelboard, the following steps shall be taken:
1. Retighten relay connections to the manufacturer's torque specifications. Verify that required connections have been furnished.
2. Remove shipping blocks from component devices and the panel interior.
3. Remove debris from panelboard interior.

R. Follow manufacturers' instructions for installation and all low voltage wiring.

S. Service and Operation Manuals:
1. Submit operation and service manuals. Complete manuals shall be bound in flexible binders and data shall be typewritten or drafted.
2. Manuals shall include instructions necessary for proper operation and servicing of system and shall include complete wiring circuit diagrams of system, wiring destination schedules for circuits and replacement part numbers. Manuals shall include as-built cable Project site plot plans and floor plans indicating cables, both underground and in each building with conduit, and as-built coding used on cables. Programming forms of systems shall be submitted with complete information.

T. Comply with energy code lighting control system "Acceptance Requirements". Acceptance tests are used to verify that lighting controls were installed and calibrated correctly. These tests may require that a responsible party certify that controls are installed and calibrated properly. This is the installing contractor's responsibility. Verify requirements with building authority.

3.3 DOCUMENTATION

A. Each relay shall have an identification label indicating the originating branch circuit number and panelboard name as indicated on the drawings. Each line side branch circuit conductor shall have an identification tag indicating the branch circuit number.

B. Provide a point-to-point wiring diagram for the entire lighting control system. Diagram must indicate exact mounting location of each system device. This accurate "as built" shall indicate the loads controlled by each relay and the identification number for that relay, placement of switches and location of photocell. Original to be given to owner, copies placed inside the door of each LCP.

3.4 SERVICE AND SUPPORT

A. Start Up: EC shall contact LC&D at least 7 days before turnover of project. LC&D will remotely dial into the lighting control system, run diagnostics and confirm system programming. EC shall be available at the time of dial in to perform any corrections required by LC&D. EC is responsible for coordinating with GC and the owner the installation of a dedicated telephone line or a shared phone line with an automatic Fax/Modem switch. Phone jack to be mounted within 12" of Master LCP. Label jack with phone number. EC to connect phone line from jack to Master LCP.

B. Telephone factory support shall be available at no additional cost to the EC or Owner both during and after the warranty period. Factory to pre-program the lighting control system per plans and approved submittal, to the extent data is available. The specified manufacturer, at no added cost, shall provide additional remote programming via modem as required by the EC or Owner for as long as a phone line is available for the life of the

system. Upon request manufacturer to provide remote dial up software at no added cost to system owner. No exceptions.

C. Provide a factory technician for on-site training of the owners' representatives and maintenance personnel. Coordinate timing with General Contractor. Provide ___ days of factory on-site training.

3.5 CLEANING

A. Division 1 - Execution Requirements: Final cleaning.

B. Clean photocell lens as recommended by manufacturer.

C. Clean all switch faceplates.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Specification sections, apply to work covered by this Section.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of all site electrical work.

B. The site electrical work shall include, but not be limited to, the furnishing and installation of necessary materials and making arrangements for:

1. The connection of electrical and telephone utilities.

2. Underground conduit.

1.3 SUBMITTALS

A. Submit product data and shop drawings in accordance with Section for products specified under PARTS 2 PRODUCTS.

1.4 REFERENCE STANDARDS

A. National Electrical Code (NEC), Article 300

B. Service installation standards of the serving utility company(s).

PART 2 PRODUCTS

2.1 ELECTRICAL SERVICE

A. Coordination: The location of the service entrance shall be coordinated with all other trades. Provide materials and equipment required to connect the electrical service. Contractor shall coordinate with the Power Company for all requirements prior to bid date. Contractor shall include all cost to for Utility Company to extend service to project site bid.

B. Materials: Provide materials in accordance with other Sections of these Specifications.

2.2 COMMUNICATION SERVICE

A. Coordination: The location of the telephone, cable, and internet service entrance shall be coordinated with all other trades. Provide materials and equipment required to connect the telephone, cable and internet services. Contractor shall coordinate with the Telephone , cable, and internet company for all requirements prior to bid date. Contractor is responsible to coordinate with utility companies.

B. Materials: Provide materials in accordance with other sections of this specification.

PART 3 EXECUTION

3.1 GENERAL

A. Underground installation of more than one conduit shall be in a duct arrangement as indicated. All conduits shall be laid so joints are staggered. All bends and stub-ups shall be rigid steel.

B. Pour a red colored concrete envelope 3" thick over utility service, emergency generator and fire pump conduits. Where conduits cross a driveway, road or parking area, reinforcing rods shall be installed.

C. Perform excavation, shoring, backfilling and concrete work in connection with electrical work in accordance with other sections of the Specifications.

D. All conduit shall be sloped away from the building to negate water entering the building through the conduit system.

3.2 UTILITIES

A. The locations, elevations and voltage of electrical lines and the location of the telephone lines included within the area of this work are indicated on the Drawings or in the Specifications in accordance with information received by the Architect/Engineer and Owner.

B. The Contractor shall examine the site and shall verify, to his own satisfaction, the location and elevation of all utilities, and shall adequately inform himself as to their relation to the work.

C. Existing utility lines not indicated but encountered during construction shall be protected, relocated or capped as directed by the Architect/Engineer. All precautions shall be exercised to prevent damage to existing lines not shown, but should work become necessary, it must be authorized prior to execution except in an emergency situation.

D. Before beginning excavations of any nature whatsoever, the Contractor shall make an attempt to locate all underground utilities of every nature occurring within the bounds of the area to be excavated. The Contractor shall then proceed with caution in his excavation work so that no utility shall be damaged with a resultant loss of service.

E. Should a damage result to any utility through the Contractor's negligence or failure to comply with the above directive, he shall be liable for such damage and for all expense incurred in the expeditious repair or replacement of such damaged utilities.

F. Repair of damaged utilities shall be to a condition equal to or better than the adjacent undamaged portion of such utility and to the complete satisfaction of the Architect/Engineer and Owner.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes load centers and panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:

1. Lighting and appliance branch-circuit panelboards.
2. Distribution panelboards.

B. Related Sections include the following:

1. Section "Fuses."

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. RFI: Radio-frequency interference.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

F. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, TVSS device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
    a. Enclosure types and details for types other than NEMA 250, Type 1.
    b. Bus configuration, current, and voltage ratings.
    c. Short-circuit current rating of panelboards and overcurrent protective devices.
    d. UL listing for series rating of installed devices.
    e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

C. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.

D. Field Test Reports: Submit written test reports and include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

F. Maintenance Data: For panelboards and components to include in maintenance manuals specified in other sections. In addition to requirements specified in Section "Contract Closeout," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.7 EXTRA MATERIALS

A. Keys: [SIX] 6 spares of each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:

a. Eaton

b. Square D Co.

c. General Electric

2.2 FABRICATION AND FEATURES

A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1, to meet environmental conditions at installed location.

1. Outdoor Locations: NEMA 250, Type 3R.

2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

3. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

C. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

D. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.

E. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.

F. Bus: Hard-drawn copper, 98 percent conductivity.

G. Main and Neutral Lugs: Copper mechanical type suitable for use with conductor material.

H. Equipment Ground Bus: Copper and adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

I. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

J. Isolated Equipment Ground Bus: Copper and adequate for branch-circuit equipment ground conductors; insulated from box.

K. Extra-Capacity Neutral Bus: Copper neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.

L. Split Bus: Vertical buses divided into individual vertical sections.

M. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.

N. Gutter Barrier: Arrange to isolate individual panel sections.

O. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

P. Feed-through Lugs: Copper mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Plug-in or bolt on circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 DISTRIBUTION PANELBOARDS

A. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch overcurrent protective devices shall be one of the following:

1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in or Bolt-on circuit breakers.
2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.6 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
4. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
5. GFCI Circuit Breakers: Single- and two-pole configurations with [5] [30]-mA trip sensitivity.

B. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.
1. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mounting Heights: Top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.

C. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

D. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

E. Install filler plates in unused spaces.

F. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section "Basic Electrical Materials and Methods] [Electrical Identification."

B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

A. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.

B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:
1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:

1. Measure as directed during period of normal system loading.

2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data-processing, computing, transmitting, and receiving equipment.

3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.

4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.5 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.6 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Specification sections, apply to work covered by this Section.

B. Comply with Electrical Sections, as applicable. Refer to other Sections for coordination of work.

C. The furnishing and installation of control power wiring required for equipment furnished under HVAC sections and not shown on the electrical drawings shall be furnished under HVAC Sections. Control power wiring is defined as the line voltage (120V) power wiring for equipment control cabinets, temperature control, energy management, or building automation system panels and line voltage smoke/fire dampers. Provide 120V to equipment control devices. Coordinate with HVAC sections prior to rough-ins.

D. The furnishing and installation of the temperature control wiring, energy management system or building automation wiring not shown on the electrical drawings shall be furnished under HVAC sections. Temperature control, energy management system and building automation system wiring is defined as the interlock or interconnecting wiring required between system control devices, appurtenances and control panels to allow the system to function automatically. This includes wiring between the fire alarm system, smoke exhaust systems, door entry systems and any other system requiring interface with the temperature control, energy management and building automation system.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of power wiring to each motor-driven and/or electrically-operated system or unit of equipment.

B. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of the line voltage wiring serving power to a motor(s) or piece of electric powered equipment. The wiring shall allow the motor(s) or equipment to operate in a manual mode.

C. All control wiring above the ceiling or in the A/C return plenum shall be plenum rated cable.

D. Provide labor, materials, equipment, tools and services and perform operations required for, and reasonably incidental to, the providing of control wiring for miscellaneous systems. The Contractor shall be responsible for reviewing the project specifications to ascertain the extent of the control wiring required for the miscellaneous systems and shall assume the responsibility for performing the work.

E. Provide labor, materials, equipment, tools and services, and perform operations required for and reasonably incidental to, the providing of a fully connected and operating smoke damper installation. Coordinate with the mechanical contractor th required work. The following is a description of the responsibilities for the specified system:

1 The mechanical contractor will provide the smoke dampers and actuators as indicated in the specifications and on the plans. In addition, if the smoke dampers have pneumatic actuators, the mechanical contractor will provide all control air piping from a source to each smoke damper and the electro-pneumatic (EP) and/or pneumatic-electric (PE) switches as required for actuation of the smoke dampers.

2 The electrical contractor shall provide the power wiring for the smoke damper actuators.

3 The fire alarm contractor shall provide the signal and control wiring for the operation of the smoke dampers including all wiring of EP and/or PE switches.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials and equipment provided hereinafter shall comply with other Electrical Sections and with HVAC/Plumbing Specifications.

PART 3 - EXECUTION

3.1 MOTORS

A. Except for items that are furnished with factory-installed, integral motors, an electric motor of required size and electrical characteristics will be provided and installed as specified in Section HVAC for each item of motor-driven equipment. As part of the work of this Section, complete the electrical installation of these motors in accordance with approved wiring diagrams and instructions.

B. Where disconnect switches or circuit breakers are not provided integral with control equipment for motors and other electrical appurtenances, provide and install all disconnect switches required by the National Electrical Code and/or as indicated on the Drawings.

3.2 SYSTEM, EQUIPMENT AND DEVICE WIRING

A. Connect complete for operation all items of heating, ventilation, air conditioning, plumbing, fire protection and all electrical systems, equipment and devices furnished by the Owner or specified in other sectionss of the Specifications. System, equipment and device outlets of various types have been indicated in the Specifications or on the drawings, but indication of exact location or scope of the work may not be indicated. Refer to the Owner and to the work specified in the other sections for the scope of connections to the equipment furnished by them and for the exact locations of all connections to the equipment furnished by them. Power wiring shall be provided under Electrical sections as indicated. Control wiring not indicated to be provided under Electrical sections shall be provided by the provider of the system, equipment, or device and installed and terminated under Electrical sections. Request all rough-in drawings required for proper installation of the electrical work in ample time to permit preparation of the installation drawings and thus avoid delays on the job.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes receptacles, connectors, switches, and finish plates.

1.3 DEFINITIONS

A. GFI: Ground-fault circuit interrupter.

B. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

A. Product Data: For each product specified.

B. Shop Drawings: Legends for receptacles and switch plates.

C. Samples: For devices and device plates for color selection and evaluation of technical features.

D. Maintenance Data: For materials and products to include in maintenance manuals specified in other sections.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NEMA WD 1.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

B. Coordinate with pool contractor for special receptacles.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wiring Devices:
    a. Bryant Electric, Inc.
    b. Eagle Electric Manufacturing Co., Inc.
    c. GE Company; GE Wiring Devices.
    d. Hubbell, Inc.; Wiring Devices Div.
    e. Killark Electric Manufacturing Co.
    f. Leviton Manufacturing Co., Inc.
    g. Pass & Seymour/Legrand; Wiring Devices Div.
    h. Pyle-National, Inc.; an Amphenol Co.

2.2 RECEPTACLES

A. Straight-Blade and Locking Receptacles: Heavy-Duty grade. The device shall be 20-ampere, 125-volts, Nema configuration 5-20R, back and side wired.

B. Special Receptacles for NEMA configuration refer to Manufacturer specs.

C. GFI Receptacles: Feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle arranged to protect connected downstream receptacles on same circuit. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter. Device shall have an indicator light.

D. Isolated-Ground Receptacles: Equipment grounding contacts connected only to the green grounding screw terminal of the device with inherent electrical isolation from mounting strap. **Device shall be white finish with the orange symbol.**

1. Devices: Listed and labeled as isolated-ground receptacles.
2. Isolation Method: Integral to receptacle construction and not dependent on removable parts.

2.3 SWITCHES

A. General

1. Switches shall be toggle rocker type as indicated herein.. The body of the switch shall be made of an arc-resistant thermoset material. All toggle switch handles shall be constructed of a thermoplastic material. All rocker switch handles shall be constructed of a thermoset material. All wall switches shall be of the quiet AC type.

1. Switches shall be SPST, DPST, 3-way or 4-way as indicated on the Drawings.
2. Switch color shall be white unless noted otherwise. Coordinate with Architect.

B. Specification Grade

1. Specification Grade switches shall be toggle type. The contact arms shall be made of one-piece copper alloy material. The switch shall include a green ground screw attached to the mounting strap. The switch shall be 20-ampere, 120/277-volts AC, horsepower rated, back and side-wired.

C. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible and electromagnetic noise filters.

1. Control: Continuously adjustable slide, toggle, or rotary knob. Single-pole or three-way switch to suit connections.
2. Incandescent Lamp Dimmers: Modular, 120 V, 60 Hz with continuously adjustable slide with “on/off” switch; single pole with soft tap or other quiet switch; electromagnetic filter to eliminate noise, RF, and TV interference; and 5-inch (130-mm) wire connecting leads. Dimmer to be sized per circuit load.

2.4 WALL PLATES(All wall plates)

A. For all single and combination types match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.04-inch- (1-mm-) thick, Type 302, satin-finished stainless steel.
3. Material for Unfinished Spaces: stainless steel.

2.5 FLOOR SERVICE FITTINGS

A. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.

B. Signal Outlet: Blank cover with bushed cable opening, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies plumb and secure.

B. Install wall plates when painting is complete.

C. Install wall dimmers to achieve indicated rating after derating for ganging as instructed by manufacturer.

D. Do not share neutral conductor on load side of dimmers.

E. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

F. Protect devices and assemblies during painting.

G. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Section "Electrical Identification."

B. Comply with Section "Basic Electrical Materials and Methods."

1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.

2. Receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.3 CONNECTIONS

A. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.

B. Isolated-Ground Receptacles: Connect to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.

C. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.

B. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

C. Replace damaged or defective components.

3.5 CLEANING

A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Fuses.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Specification Sections.

B. Product Data for each fuse type specified.

C. Field test reports indicating and interpreting test results.

D. Maintenance data for tripping devices to include in the operation and maintenance manual specified in other sections.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from one source and by a single manufacturer.

B. Comply with NFPA 70 for components and installation.

C. Listing and Labeling: Provide fuses specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.5 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Spare Fuses: Furnish quantity equal to 20 percent of each fuse type and size installed, but not less than 1 set of 3 of each type and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fuses that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide fuses by one of the following:

1. Cooper Industries, Inc.; Bussmann Div.

2. Eagle Electric Mfg. Co., Inc.

3. Ferraz Corp.

4. General Electric Co.; Wiring Devices Div.

5. Gould Shawmut.

6. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class as specified or indicated; current rating as indicated; voltage rating consistent with circuit voltage.

2.3 SPARE FUSE CABINET

A. Cabinet: Wall-mounted, 0.05-inch- (1.27-mm-) thick steel unit with full-length, recessed piano-hinged door with key-coded cam lock and pull.

1. Size: Adequate for orderly storage of spare fuses specified with 15 percent spare capacity minimum.
2. Finish: Gray, baked enamel.
3. Identification: Stencil legend "SPARE FUSES" in 1-1/2-inch (40-mm) letters on door.
4. Fuse Pullers: For each size fuse.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions to verify proper fuse locations, sizes, and characteristics.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Motor Branch Circuits: Class RK1, time delay.

B. Other Branch Circuits: Class RK5, non-time delay.

3.3 INSTALLATION

A. Install fuses in fusible devices as indicated. Arrange fuses so fuse ratings are readable without removing fuse.

B. Install spare fuse cabinet where indicated.

3.4 IDENTIFICATION

A. Install typewritten labels on inside door of each fused switch to indicate fuse replacement information.

END OF SECTION

SECTION 26 28 18 ENCLOSED SWITCHES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Specification sections, apply to work covered by this Section.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of disconnect switches, including all related systems and accessories.

1.3 SUBMITTALS

A. Submit product data and shop drawings in accordance with other Sections for products specified under PART 2 - PRODUCTS.

B. Provide outline drawings with dimensions, and equipment ratings for voltage, amperage, horsepower and short circuit.

C. Provide designations for each disconnect. RE: to section 16075.

1.4 REFERENCE STANDARDS

A. Switches shall be manufactured in accordance with the following standards:

1. UL 98 - Enclosed and Dead Front Switches
2. NEMA KS1 - Enclosed Switches
3. NEMA 250 - Enclosures for Electrical Equipment

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Eaton

B. Square D Co.

C. Siemens

2.2 GENERAL

A. Switches shall be heavy duty type.

2.3 SWITCH INTERIOR

A. Switches shall have switch blades which are visible when the switch is OFF and the cover is open.

D. Lugs shall be copper and front removable and UL listed for 60°C or 75°C conductors 30-100 ampere, 75°C conductors 200 ampere and up.

E. Current carrying parts shall be plated to resist corrosion.

F. Switches shall have removable arc suppressor to facilitate easy access to line side lugs.

G. Switches shall have provisions for a field installable electrical interlock.

2.4 SWITCH MECHANISM

A. Switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started.

B. The operating handle shall be an integral part of the box, not the cover.

C. Provisions for padlocking the switch in the OFF position with at least three padlocks shall be provided.

D. The handle position shall travel at least 90° between OFF and ON positions to clearly distinguish and

indicate handle position.

E. Switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is ON and prevent turning the switch ON when the cover is open. The cover interlock mechanism shall have an externally operated override but the override shall not permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

2.5 SWITCH ENCLOSURES

A. Switch covers shall be attached with welded pin-type hinges (Type 1) or top-hinged, attached with removable screws and securable in the open position (Type 3R).

B. The enclosure shall be finished with gray baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated steel (Type 1) or gray baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated galvannealed steel (Type 3R).

C. The enclosure shall have ON and OFF markings stamped into the cover.

D. The operating handle shall be provided with a dual colored, red/black position indication.

E. Switches shall have provisions to accept up to three 3/8" hasp padlocks to lock the operating handle in the OFF position.

H. Tangential knockouts shall be provided to facilitate ease of conduit entry (Type 1).

I. Type 3R enclosure shall contain no knockouts. Supply watertight hubs.

J. Type 4x shall be stainless steel enclosure with no knockouts. Supply watertight hubs.

2.6 SWITCH RATINGS

A. Switches shall be horsepower rated.

B. The UL listed short circuit current rating of the switches shall be: 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses 30-600 ampere employing appropriate fuse rejection schemes.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install disconnect switches where indicated shown or not shown.

B. Install fuses in fusible disconnect switches.

END OF SECTION

SECTION 26 43 13 SURGE PROTECTIVE DEVICES FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions, apply to work covered by this Section.

B. Comply with Electrical Sections, as applicable. Refer to other Sections for coordination of work.

1.2 SCOPE OF WORK

A. Provide labor, material, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of a high-energy power conditioning surge protection device(s) at branch circuit panelboards where indicated on the Drawings. The device shall incorporate transient voltage surge suppression (TVSS) and high-frequency electrical line noise filtering. The device shall provide effective high energy transient voltage suppression, surge current diversion, high-frequency attenuation, and line stabilization in ANSI/IEEE C62.41-2002 environments connected downstream from the facility's main overcurrent protective device. The device shall be connected in parallel with the facility's wiring system.

B. The device shall be installed as an integral part or external of the panelboard, switchboard.

1.3 SUBMITTALS

A. Submit product data and shop drawings for products specified under PART 2 - PRODUCTS.

B. Manufacturers' Product Data: Submit material specifications and installation data for products specified under PART 2 - PRODUCTS.

C. Shop Drawings: Submit shop drawings to indicate information not fully described by the product data to indicate compliance with the contract documents.

1 Include electrical characteristics and ratings for the specified equipment.

2 Include wiring diagrams indicating the internal connections of the specified equipment within its enclosure.

3 Drawings shall be provided indicating device dimensions, weights, mounting provisions, connection details and wiring diagrams.

4 Documentation of the specified device UL 1449 3rd Edition voltage protection rating (VPR) and per mode surge current rating shall be included. All submittals without this documentation will be rejected.

5 The manufacturer shall make available upon request certified documentation of applicable Location Category Testing in full compliance with ANSI/IEEE C62.41-1991 and ANSI/IEEE C62.45-1987 Guidelines.

D. Record Drawings

1 A complete set of manufacturers' product data and shop drawings indicating all post bid revisions and field changes.

1.4 QUALITY ASSURANCE

A. Industry Reference Standards and Publications: The device shall be designed, manufactured, tested and installed in compliance with the latest editions of:

1 American National Standards Institute (ANSI) and Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.41-2002 and C62.45-2002)

2 Federal Information Processing Standards Publication 94 (FIPS PUB 94)

3 National Electrical Manufacturers Association (NEMA LS-1)

4 National Fire Protection Association (NFPA 70, National Electrical Code (NEC), 75 and 78)

5 Underwriters Laboratories UL 1449 Standard for Transient Voltage Surge Suppressors Surge Protection Devices and UL 1283 Standard for Electromagnetic Interference Filters.

B. The device shall be UL listed under UL 1449 and UL 1283 complimentary listed.

C. The device shall be warranted against defects in material and/or workmanship and any failure or end-of-life event including lighting for a minimum of TEN (10) years from the date of shipment.

D. The device shall be thoroughly factory-tested before shipment. Testing of the device shall include but not be limited to quality control checks, maximum continuous operating voltage (MCOV) check, and clamping voltage verification tests. The MCOV check shall consist of a minimum of one (1) hour burn-in at the applicable MCOV.

1.5 SYSTEM DESCRIPTION

A. Environmental Requirements

1 Storage Temperature: Storage temperature range shall be -40º to +85º C (-40º to +185º F).

2 Operating Temperature: Operating temperature range shall be -40º to +60º C (-40º to 140º F).

3 Relative Humidity: Operation shall be reliable in an environment with 5% to 95% non-condensing relative humidity.

4 Operating Altitude: The device shall be capable of operation in an altitude of 0 - 12,000 feet above sea level.

5 Audible Noise: The device shall not generate any audible noise.

6 Magnetic Fields: No appreciable magnetic fields shall be generated. The device shall be capable of use directly in computer rooms in any location without danger to data storage systems or devices.

B. Electrical Requirements

1 Device Operating Voltage: The nominal operating voltage and configuration shall be that of the switchgear, distribution panel, sub or branch panelboard. Maximum Continuous Operating Voltage (MCOV): The allowable maximum continuous operating voltage of all suppression components utilized in the unit shall not be less than 115% of the nominal operating voltage.

2 Operating Frequency: The operating frequency range of the device shall be 47 to 63 Hertz.

3 Protection Modes: The devices primary mode of protection shall be line-to-neutral. The secondary modes of protection shall be line-to-ground and neutral-to-ground.

4 Surge Current Capacity and Voltage Protection Rating: Unless specifically noted on the drawings and/or the schedules, the surge current capacity, and the voltage protection rating of the SPD shall be not less than listed on the following table.

The above text gives you the option to request a specific surge current rating on the riser or panel schedules

5. Construction: SPD's with a surge current rating of greater than 155,000 amps per mode shall be field serviceable modular devices. SPD's with a surge current rating of less than 155,000 amps may be non-modular.

Location	Per Mode Surge Current Rating	120/208vac 3 phase VPR	277/480vac 3 phase VPR
Switchgear	200,000 amps	900v	1200v
Distribution Panel	150,000 amps	900v	1200v
Sub or Branch Panel	100,000 amps	900v	1200v

1.6 DOCUMENTATION

A. Equipment Manual. The manufacturer shall furnish an equipment manual with installation, operation, and maintenance instructions for the system.

PART 2 - PRODUCTS

2.1 MANUFACTURER

1 Square D

2 Cutler-Hammer

3 Current Technology

4 THOR SYSTEMS

2.2 TRANSIENT VOLTAGE SURGE SUPPRESSION COMPONENTS

A. The device shall include a solid-state suppression system which includes arrays of fused non-linear voltage dependent metal oxide varistors (MOV's) with similar operating characteristics. The suppression system shall not utilize gas tubes, spark gaps, silicon avalance diodes or other components which might short or crowbar the line, thus leading to interruption of normal power flow to or system upset of connected loads. The suppression system shall not incorporate any other components which may degrade performance or reliability of the

2.3 HIGH-FREQUENCY FILTER

A. The device shall include a UL 1283 high frequency extended range tracking filter. The filter shall reduce fast rise-time, high-frequency, error-producing transients and electrical line noise eliminating disturbances which may lead to system upset. The filter shall provide minimum insertion loss of 45 dB at 100 kHz attenuation frequency utilizing the MIL-STD-E220A 50 ohm insertion loss methodology.

2.4 INTERNAL CONNECTIONS

A. All internal wiring associated with the suppression/filter device and subject to surge currents shall utilize low-impedance copper bus bar and/or #4 AWG copper conductor or larger. All internal connections associated with the suppression/filter device and subject to surge currents shall be made with compression solderless-type lugs and shall be bolted to the bus bars in order to reduce overall system impedance.

2.5 FIELD CONNECTIONS

A. The device shall include mechanical lugs for each phase, neutral and ground, or permanently connected conductors as applicable. The lugs shall accommodate up to #4 AWG copper conductor.

2.6 ENCLOSURE

A. The device shall be provided in a surface mounted NEMA 1 type hinged enclosure, with a NEMA rating that matches or exceeds that of the switchgear, distribution panel, sub or branch panelboard that is being protected. of minimum 14 gauge steel, painted inside and out. Enclosure width shall not be greater than 24 inches.

2.7 MONITORING

A. The device shall include solid-state, long-life externally mounted LED visual status indicators that indicate the on-line status of each phase of the unit.

B. Dry Contacts

C. Audible alarm with silence switch

D. For Service Entrance or Switchgear SPD’s: LED visual status indicators, Audible alarm with silence switch, Dry Contacts plus Surge Event Counter.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The installation and testing of the system shall be in full accordance with the manufacturer's installation, operation and maintenance instructions, and all national and local codes.

B. The device shall be installed as close as practical to the facility's wiring system in accordance with NEC Article 285, IEEE 1100-2005 section 8.4.2.5, plus applicable national/local electrical codes and the manufacturer's recommended installation instructions. Connection shall be from a minimum 40A branch circuit breaker in the switchgear, distribution panel or panelboard with #4 AWG copper conductors not any longer than necessary, avoiding unnecessary bends. Advise the engineer if the installed In no case shall conductors will be longer than 3 feet in length. Verify circuit breaker size with manufacturer.

3.2 TESTING

A. The system shall be field tested in the presence of the Owner. At the same time operational procedures shall be reviewed with the Owner.

B. If external test equipment is required, two (2) testers shall be furnished to the owner and two (2) training sessions shall be furnished. The first training session shall be with 90 days of occupancy and the second training session shall be not less eight months, but not more than 12 months after the first training session. Training and test equipment shall be furnished at no additional cost to the owner.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

A. This Section includes interior lighting fixtures, lighting fixtures mounted on exterior building surfaces, emergency lighting units, and accessories.

B. Related Sections include the following:

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture indicated, arranged in order of fixture designation. Include data on features, accessories, and the following:

1. Dimensions of fixtures.
2. Certified results of laboratory tests for fixtures and lamps for photometric performance.
3. Emergency lighting unit battery and charger.
4. LED lights
5. Types of lamps.

B. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, method of field assembly, components, features, and accessories.

1. Wiring Diagrams: Detail wiring for fixtures and differentiate between manufacturer-installed and field-installed wiring.

C. Coordination Drawings: Reflected ceiling plans and sections drawn to scale and coordinating fixture installation with ceiling grid, ceiling-mounted items, and other components in the vicinity. Include work of all trades that is to be installed near lighting equipment.

D. Product Certificates: Signed by manufacturers of lighting fixtures certifying that products comply with requirements.

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

F. Maintenance Data: For lighting fixtures to include in maintenance manuals in the close out documents.

1.4 QUALITY ASSURANCE

A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by an acceptable to authorities having jurisdiction.

B. Comply with NFPA 70.

C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.5 COORDINATION

A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in the Interior Lighting Fixture Schedule at the end of Part 3.

B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Interior Lighting Fixture Schedule in the plans. Submit Manufacturers as is in the Lighting Fixture Schedule or Equal. Submit Equal Manufacturers 10 days prior to bidding day for approval. For Equal Manufacturers submit lighting calculation for each equal fixture submitted for approval.

2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

D. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or annealed crystal glass, unless otherwise indicated.

1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
2. Lens Thickness: 0.125 inch (3 mm) minimum, unless greater thickness is indicated.

2.3 LED FIXTURES

A. Except as otherwise indicated, provide LED luminaires, of types and sizes indicated on fixture schedules.

B. Include the following features unless otherwise indicated:

1. Each Luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply).

2. Each luminaire shall be rated for a minimum operational life of 50,000 hours utilizing a minimum ambient temperature of (25°C).

3. Light Emitting Diodes tested under LM-80 Standards for a minimum of 12,000 hours.
4. Color Rendering Index (CRI) of 82 at a minimum.

5. Color temperature [3500] <Insert value> K, unless otherwise indicated.
6. Rated lumen maintenance at 70% lumen output for 50,000 hours, unless otherwise indicated.

7. Fixture efficacy of 60 Lumens/Watt, minimum.

8. 5 year luminaire warranty, minimum.

9. Photometry must comply with IESNA LM-79.

10. The individual LEDs shall be constructed such that a catastrophic loss of the failure of one LED will not result in the loss of the entire luminaire.

11. Luminaire shall be constructed such that LED modules may be replaced or repaired without the replacement of the whole fixture.

C. Technical Requirements

1. Luminaire shall have a minimum efficacy of 60 lumens per watt. The luminaire shall not consume power in the off state.

2. Operation Voltage: The luminaire shall operate from a 50 HZ to 60 HZ AC line over a voltage ranging from 120 VAC to 277 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.

3. Power Factor: The luminaire shall have a power factor of 0.9 or greater.

4. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 15 percent.

5. Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.

D. Thermal Management

1. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.

2. The LED manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.

3. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.

4. The luminaire shall have a minimum heat sink surface such that LED manufacturer's maximum junction temperature is not exceeded at maximum rated ambient temperature.

2.4 LED EXIT SIGNS

A. Exit light fixtures shall meet applicable requirements of NFPA and UL.

B. Housing and door shall be die-cast aluminum.

C. For general purpose exit light fixtures, door frame shall be hinged, with latch. For vandal-resistant exit light fixtures, door frame shall be secured with tamper-resistant screws.

D. Finish shall be satin or fine-grain brushed aluminum.

E. There shall be no radioactive material used in the fixtures.

F. Fixtures:

1. Inscription panels shall be cast or stamped aluminum a minimum of 2.25 mm (0.090 inch) thick, stenciled with 150 mm (6 inch) high letters, baked with red color stable plastic or fiberglass. Lamps shall be luminous Light Emitting Diodes (LED) mounted in center of letters on red color stable plastic or fiberglass.

2. Double-Faced Fixtures: Provide double-faced fixtures where required or as shown on drawings.

3. Directional Arrows: Provide directional arrows as part of the inscription panel where required or as shown on drawings. Directional arrows shall be the "chevron-type" of similar size and width as the letters and meet the requirements of NFPA 101.

G. Voltage: Multi-voltage (120 – 277V).

2.5 EMERGENCY LIGHTING UNITS

A. General Requirements: Self-contained units. Comply with UL 924. Units include the following features:

1. Battery: Sealed, maintenance-free, lead-acid type with minimum 5-year nominal life and special warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.

2.6 LAMPS

A. ALL LED – NO LAMPS

2.7 FINISHES

A. Fixtures: Manufacturer's standard, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.

B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Do not use grid for support.

1. Install a minimum of two ceiling support system wires for each fixture. Locate not more than 6 inches (150 mm) from fixture corners.

2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner.

3. Fixtures of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.

C. Suspended Fixture Support: As follows:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.

2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3.2 CONNECTIONS

A. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Advance Notice: Give dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests: As follows:

1. Verify normal operation of each fixture after installation.

2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.

3. Verify normal transfer to battery source and retransfer to normal.

4. Report results in writing.

E. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

F. Corrosive Fixtures: Replace during warranty period.

3.4 CLEANING AND ADJUSTING

A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes exterior lighting units with luminaries and lamps.

B. Related Sections include the following:

1. Section "Interior Lighting" for interior fixtures, lamps, ballasts, emergency lighting units, and accessories; and for exterior luminaires normally mounted on buildings.

1.3 DEFINITIONS

A. Lighting Unit: A luminaire or an assembly of luminaires complete with a common support, including pole, post, or other structure, and mounting and support accessories.

B. Luminaire (Light Fixture): A complete lighting device consisting of lamp(s) and ballast(s), when applicable, together with parts designed to distribute light, to position and protect lamps, and to connect lamps to power supply.

1.4 SUBMITTALS

A. Product Data: For each type of lighting unit indicated, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Materials and dimensions of luminaries.
2. Certified results of independent laboratory tests for fixtures and lamps for electrical ratings and photometric data.
3. Certified results of laboratory tests for fixtures and lamps for photometric performance.
4. High-intensity-discharge luminaire ballasts.

B. Product Certificates: Signed by manufacturers of lighting units certifying that products comply with requirements.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

D. Maintenance Data: For lighting units to include in maintenance manuals specified in other sections.

1.5 QUALITY ASSURANCE

A. Luminaires and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use, location, and installation conditions by acceptable to authorities having jurisdiction

B. Comply with ANSI C2.

C. Comply with NFPA 70.

1.6 WARRANTY

A. General Warranty: LED fixture warranty is a five year limited warranty. Pole standard warranty is one year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in the Exterior Lighting Unit Schedule at the end of Part 3.

B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Interior Lighting Fixture Schedule in the plans. Submit Manufacturers as is in the Lighting Fixture Schedule or Equal. Submit Equal Manufacturers 10 days prior to bidding day for approval. For Equal Manufacturers submit lighting calculation for each equal fixture submitted for approval.

2.2 LUMINAIRES

A. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

B. Metal Parts: Free from burrs, sharp corners, and edges.

C. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.

D. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

E. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position. Provide for door removal for cleaning or replacing lens. Arrange to disconnect ballast when door opens.

F. Exposed Hardware Material: Stainless steel.

G. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.

H. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

I. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor in luminaire doors.

J. Photoelectric Relays: As follows:

1. Contact Relays: Single throw, arranged to fail in the on position and factory set to turn light unit on at 1.5 to 3 fc (16 to 32 lx) and off at 4.5 to 10 fc (48 to 108 lx) with 15-second minimum time delay.
2. Relay Mounting: In luminaire housing.

K. High-Intensity-Discharge Ballasts: Comply with ANSI C82.4. Constant wattage autotransformer or regulating high-power-factor type, unless otherwise indicated.

1. Single-Lamp Ballasts: Minimum starting temperature of minus 40 deg C.
2. Open-circuit operation will not reduce average life.
3. High-Pressure Sodium Ballasts: Equip with a solid-state igniter/starter having an average life in pulsing mode of 10,000 hours at an igniter/starter case temperature of 90 deg C.
4. Noise: Uniformly quiet operation, with a noise rating of B or better.

L. Lamps: Comply with the standard of the ANSI C78 series that is applicable to each type of lamp. Provide luminaires with indicated lamps of designated type, characteristics, and wattage. Where a lamp is not indicated for a luminaire, provide medium wattage lamp recommended by manufacturer for luminaire.

A. LED sources shall meet the following requirements:

1. Operating temperature rating shall be between -40 degrees C (-40 degrees F) and 50 degrees C (120 degrees F).
2. Correlated Color Temperature (CCT): 4000K

3. Color Rendering Index (CRI): ³ 85.

4. The manufacturer shall have performed reliability tests on the LEDs luminaires complying with Illuminating

LED DRIVERS

A. LED drivers shall meet the following requirements:

1. Drivers shall have a minimum efficiency of 85%.

2. Starting Temperature: -40 degrees C (-40 degrees F).

3. Input Voltage: 120 to 480 (±10%) volt.

4. Power Supplies: Class I or II output.

5. Surge Protection: The system must survive 250 repetitive strikes of “C Low” (C Low: 6kV/1.2 x 50 µs, 10kA/8 x 20 µs) waveforms at 1-minute intervals with less than 10% degradation in clamping voltage. “C Low” waveforms are as defined in IEEE/ASNI C62.41.2-2002, Scenario 1 Location Category C.

6. Power Factor (PF): ≥ 0.90.

7. Total Harmonic Distortion (THD): ≤ 20%.

8. Comply with FCC Title 47 CFR Part 18 Non-consumer RFI/EMI Standards.

9. Drivers shall be reduction of hazardous substances (ROHS)-compliant.//

PART 3 - EXECUTION

3.1 CONNECTIONS

A. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Ground metal poles/support structures according to Section "Grounding and Bonding."

1. Nonmetallic Poles: Ground metallic components of lighting units and foundations. Connect luminaires to grounding system with No. 6 AWG conductor.

3.2 FIELD QUALITY CONTROL

A. Inspect each installed unit for damage. Replace damaged units.

B. Advance Notice: Give dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests and Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source, and as follows:

3.3 CLEANING AND ADJUSTING

A. Clean units after installation. Use methods and materials recommended by manufacturer.

END OF SECTION

SECTION 26 56 68 – EXTERIOR ATHLETIC LIGHTING

Lighting System with LED Light Source

PART 1 – GENERAL

1.1 SUMMARY

A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.

B. The purpose of these specifications is to define the lighting system performance and design standards for North Park Softball using an LED Lighting source. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth in these specifications.

C. The sports lighting will be for the following venue:

1. Softball Field

D. The primary goals of this sports lighting project are:

1. Guaranteed Light Levels: Selection of appropriate light levels impact the safety of the players and the enjoyment of spectators. Therefore light levels are guaranteed to not drop below specified target values for a period of 25 years.
2. Environmental Light Control: It is the primary goal of this project to minimize spill light to adjoining properties and glare to the players, spectators and neighbors.
3. Cost of Ownership: In order to reduce the operating budget, the preferred lighting system shall be energy efficient and cost effective to operate. All maintenance costs shall be eliminated for the duration of the warranty.
4. Control and Monitoring: To allow for optimized use of labor resources and avoid unneeded operation of the facility, customer requires a remote on/off control system for the lighting system. Fields should be proactively monitored to detect luminaire outages over a 25-year life cycle. All communication and monitoring costs for 25-year period shall be included in the bid.

1.2 LIGHTING PERFORMANCE

A. Illumination Levels and Design Factors: Playing surfaces shall be lit to an average target illumination level and uniformity as specified in the chart below. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below. Appropriate light loss factors shall be applied and submitted for the basis of design. Average illumination level shall be measured in accordance with the IESNA LM-5-04 (IESNA Guide for Photometric Measurements of Area and Sports Lighting Installations). Illumination levels shall not to drop below desired target values in accordance to IES RP-6-15, Page 2, Maintained Average Illuminance and shall be guaranteed for the full warranty period.

Area of Lighting	Average Target Illumination Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Softball (Infield)	50FC	2.0:1	25	20’ x 20’
Softball (Outfield)	30FC	2.5:1	71	20’ x 20’

B. Color: The lighting system shall have a minimum color temperature of 5700K and a CRI of 75.

C. Mounting Heights: To ensure proper aiming angles for reduced glare and to provide better playability, minimum mounting heights shall be as described below. Higher mounting heights may be required based on photometric report and ability to ensure the top of the field angle is a minimum of 10 degrees below horizontal.

# of Poles	Pole Designation	Pole Height
4	A1, A2, B1, B2	60’

1.3 ENVIRONMENTAL LIGHT CONTROL

A. Light Control Luminaires: All luminaires shall utilize spill light and glare control devices including, but not limited to, internal shields, louvers and external shields. No symmetrical beam patterns are accepted.

B. Spill Light and Glare Control: To minimize impact on adjacent properties, spill light and candela values must not exceed the following levels taken at 3 feet above grade.

At Property Line	Average	Maximum
Max Horizontal Footcandles	.05 FC	1 FC
Max Vertical Footcandles	.25 FC	2.5 FC
Max Candela	8,500 Cd	75,000 Cd

C. Spill Scans: Spill scans must be submitted indicating the amount of horizontal and vertical footcandles along the specified lines. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights. Illumination level shall be measured in accordance with the IESNA LM-5-04 after 1 hour warm up.

D. The first page of a photometric report for all luminaire types proposed showing horizontal and vertical axial candle power shall be provided to demonstrate the capability of achieving the specified performance. Reports shall be certified by a qualified testing laboratory with a minimum of five years experience or by a manufacturer’s laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. A summary of the horizontal and vertical aiming angles for each luminaire shall be included with the photometric report.

1.4 Cost of Ownership

A. Manufacturer shall submit a 25 year Cost of Ownership summary that includes energy consumption, anticipated maintenance costs, and control costs. All costs associated with faulty luminaire replacement - equipment rentals, removal and installation labor, and shipping - are to be included in the maintenance costs.

PART 2 – PRODUCT

2.2 SPORTS LIGHTING SYSTEM CONSTRUCTION

A. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, drivers and other enclosures shall be factory assembled, aimed, wired and tested.

B. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct

environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel of 18-8 grade or better, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153 and ISO/EN 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the cross-arms, pole, or electrical components enclosure.

C. System Description: Lighting system shall consist of the following:

1. Galvanized steel poles and cross-arm assembly.
2. Non-approved pole technology:
    a. Square static cast concrete poles will not be accepted.
    b. Direct bury steel poles which utilize the extended portion of the steel shaft for their foundation will not be accepted due to potential for internal and external corrosive reaction to the soils and long term performance concerns.
3. Lighting systems shall use concrete foundations. See Section 2.4 for details.
    a. For a foundation using a pre-stressed concrete base embedded in concrete backfill the concrete shall be air-entrained and have a minimum compressive design strength at 28 days of 3,000 PSI. 3,000 PSI concrete specified for early pole erection, actual required minimum allowable concrete strength is 1,000 PSI. All piers and concrete backfill must bear on and against firm undisturbed soil.
    b. For anchor bolt foundations or foundations using a pre-stressed concrete base in a suspended pier or re-inforced pier design pole erection may occur after 7 days. Or after a concrete sample from the same batch achieves a certain strength.
4. Manufacturer will supply all drivers and supporting electrical equipment
    a. Remote drivers and supporting electrical equipment shall be mounted approximately 10 feet above grade in aluminum enclosures. The enclosures shall be touch-safe and include drivers and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure will be located in the enclosure. Integral drivers are not allowed.
    b. Manufacturer shall provide surge protection at the pole equal to or greater than 40 kA for each line to ground (Common Mode) as recommended by IEEE C62.41.2_2002.
5. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
6. All luminaires, visors, and cross-arm assemblies shall withstand 150 mph winds and maintain luminaire aiming alignment.
7. Control cabinet to provide remote on-off control, monitoring, and entertainment features of the lighting system. See Section 2.3 for further details.
8. Manufacturer shall provide lightning grounding as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A.
    a. Integrated grounding via concrete encased electrode grounding system.
    b. If grounding is not integrated into the structure, the manufacturer shall supply grounding electrodes, copper down conductors, and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780.The grounding electrode shall be minimum size of 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.

D. Safety: All system components shall be UL listed for the appropriate application.

2.2 ELECTRICAL

A. Electric Power Requirements for the Sports Lighting Equipment:
   1. Electric power: See Plans
   2. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.

B. Energy Consumption: The kW consumption for the field lighting system shall be 20.75.

2.3 CONTROL

A. Instant On/Off Capabilities: System shall provide for instant on/off of luminaires.

B. Lighting contactor cabinet(s) constructed of NEMA Type 4 aluminum, designed for easy installation with contactors, labeled to match field diagrams and electrical design. Manual off-on-auto selector switches shall be provided.

C. Dimming: System shall provide for 3-stage dimming (high-medium-low). Dimming with be set via scheduling options (Website, app, phone, fax, email).

D. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

   The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields to only having permission to execute “early off” commands by phone. Scheduling tool shall be capable of setting curfew limits.

   Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.

E. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The controller shall determine switch position (manual or auto) and contactor status (open or closed).

F. Management Tools: Manufacturer shall provide a web-based database and dashboard tool of actual field usage and provide reports by facility and user group. Dashboard shall also show current status of luminaire outages, control operation and service. Mobile application will be provided suitable for IOS, Android and Blackberry devices.

   Hours of Usage: Manufacturer shall provide a means of tracking actual hours of usage for the field lighting system that is readily accessible to the owner.

   1. Cumulative hours: shall be tracked to show the total hours used by the facility
   2. Report hours saved by using early off and push buttons by users.

G. Communication Costs: Manufacturer shall include communication costs for operating the control and monitoring system for a period of 25 years.

2.4 STRUCTURAL PARAMETERS

A. Wind Loads: Wind loads shall be based on the 2012 International Building Code. Wind loads to be calculated using ASCE 7-10, an ultimate design wind speed of 140 MPH and exposure category C.

B. Pole Structural Design: The stress analysis and safety factor of the poles shall conform to 2009 AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (LTS-5).

C. Foundation Design: The foundation design shall be based on soils that meet or exceed those of a Class 5 material as defined by 2012 IBC Table 1806.2.

D. Foundation Drawings: Project specific foundation drawings stamped by a registered engineer in the state where the project is located are required. The foundation drawings must list the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole. These drawings must be submitted at time of bid to allow for accurate pricing.

PART 3 – EXECUTION

3.1 SOIL QUALITY CONTROL

A. It shall be the Contractor's responsibility to notify the Owner if soil conditions exist other than those on which the foundation design is based, or if the soil cannot be readily excavated. Contractor may issue a change order request / estimate for the Owner's approval / payment for additional costs associated with:

1. Providing engineered foundation embedment design by a registered engineer in the State of Texas for soils other than specified soil conditions;
2. Additional materials required to achieve alternate foundation;
3. Excavation and removal of materials other than normal soils, such as rock, caliche, etc.

3.2 DELIVERY TIMING

A. Delivery Timing Equipment On-Site: The equipment must be on-site 6-8 weeks from receipt of approved submittals and receipt of complete order information.

3.3 FIELD QUALITY CONTROL

A. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA LM-5-04.

B. Field Light Level Accountability

1. Light levels are guaranteed not to fall below the target maintained light levels for the entire warranty period of 25 years. These levels will be specifically stated as "guaranteed" on the illumination summary provided by the manufacturer.
2. The contractor/manufacturer shall be responsible for conducting initial light level testing and an additional inspection of the system, in the presence of the owner, one year from the date of commissioning of the lighting.
3. The contractor/manufacturer will be held responsible for any and all changes needed to bring these fields back to compliance for light levels and uniformities. Contractor/Manufacturer will be held responsible for any damage to the fields during these repairs.

C. Correcting Non-Conformance: If, in the opinion of the Owner or his appointed Representative, the actual performance levels including footcandles and uniformity ratios are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be required to make adjustments to meet specifications and satisfy Owner.

3.4 WARRANTY AND GUARANTEE

A. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years from the date of shipment. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term. Warranty does not cover weather conditions events such as lightning or hail damage, improper installation, vandalism or abuse, unauthorized repairs or alterations, or product made by other manufacturers.

B. Maintenance: Manufacturer shall monitor the performance of the lighting system, including on/off status, hours of usage and luminaire outage for 25 years from the date of equipment shipment. Parts and labor shall be covered such that individual luminaire outages will be repaired when the usage of any field is materially impacted. Manufacturer is responsible for removal and replacement of failed luminaires, including all parts, labor, shipping, and equipment rental associated with maintenance. Owner agrees to check fuses in the event of a luminaire outage.

PART 4 – DESIGN APPROVAL

4.0 PRE-BID SUBMITTAL REQUIREMENTS (Non-Musco)

A. Design Approval: The owner / engineer will review pre-bid submittals per section 4.0.B from all the manufacturers to ensure compliance to the specification 10 days prior to bid. If the design meets the design requirements of the specifications, a letter and/or addendum will be issued to the manufacturer indicating approval for the specific design submitted.

B. Approved Product: Musco's Light-Structure System™ with TLC for LED™ is the approved product. All substitutions must provide a complete submittal package for approval as outlined in Submittal Information at the end of this section at least 10 days prior to bid. Special manufacturing to meet the standards of this specification may be required. An addendum will be issued prior to bid listing any other approved lighting manufacturers and designs.

C. All listed manufacturers not pre-approved shall submit the information at the end of this section at least 10 days prior to bid. An addendum will be issued prior to bid; listing approved lighting manufacturers and the design method to be used.

D. Bidders are required to bid only products that have been approved by this specification or addendum by the owner or owner's representative. Bids received that do not utilize an approved system/design, will be rejected.

REQUIRED SUBMITTAL INFORMATION FOR ALL MANUFACTURERS (NOT PRE-APPROVED) 10 DAYS PRIOR TO BID

All items listed below are mandatory, shall comply with the specification and be submitted according to pre-bid submittal requirements. Complete the Yes/No column to indicate compliance (Y) or noncompliance (N) for each item. ***Submit checklist below with submittal.***

Yes/ No	Tab	Item	Description
	A	Letter/ Checklist	Listing of all information being submitted must be included on the table of contents. List the name of the manufacturer's local representative and his/her phone number. Signed submittal checklist to be included.
	B	Equipment Layout	Drawing(s) showing field layouts with pole locations
	C	On Field Lighting Design	Lighting design drawing(s) showing: a. Field Name, date, file number, prepared by b. Outline of field(s) being lighted, as well as pole locations referenced to the center of the field (x & y), Illuminance levels at grid spacing specified c. Pole height, number of fixtures per pole, horizontal and vertical aiming angles, as well as luminaire information including wattage, lumens and optics d. Height of light test meter above field surface. e. Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (fc); uniformity including maximum to minimum ratio, coefficient of variance (CV), coefficient of utilization (CU) uniformity gradient; number of luminaries, total kilowatts, average tilt factor; light loss factor.
	D	Off Field Lighting Design	Lighting design drawing showing initial spill light levels along the boundary line (defined on bid drawings) in footcandles. Lighting design showing glare along the boundary line in candela. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights.
	E	Photometric Report	Provide first page of photometric report for all luminaire types being proposed showing candela tabulations as defined by IESNA Publication LM-35-02. Photometric data shall be certified by laboratory with current National Voluntary Laboratory Accreditation Program or an independent testing facility with over 5 years experience.
	F	Performance Guarantee	Provide performance guarantee including a written commitment to undertake all corrections required to meet the performance requirements noted in these specifications at no expense to the owner. Light levels must be guaranteed to not fall below target levels for warranty period.
	G	Structural Calculations	Pole structural calculations and foundation design showing foundation shape, depth backfill requirements, rebar and anchor bolts (if required). Pole base reaction forces shall be shown on the foundation drawing along with soil bearing pressures. Design must be stamped by a structural engineer in the state of Texas, if required by owner.
	H	Control & Monitoring System	Manufacturer of the control and monitoring system shall provide written definition and schematics for automated control system. They will also provide ten (10) references of customers currently using proposed system in the state of Texas.
	I	Electrical Distribution Plans	Manufacturer bidding an alternate product must include a revised electrical distribution plan including changes to service entrance, panels and wire sizing, signed by a licensed Electrical Engineer in the state of Texas.
	J	Warranty	Provide written warranty information including all terms and conditions. Provide ten (10) references of customers currently under specified warranty in the state of Texas.
	K	Project References	Manufacturer to provide a list of ten (10) projects where the technology and specific fixture proposed for this project has been installed in the state of Texas. Reference list will include project name, project city, installation date, and if requested, contact name and contact phone number.
	L	Product Information	Complete bill of material and current brochures/cut sheets for all product being provided.
	M	Delivery	Manufacturer shall supply an expected delivery timeframe from receipt of approved submittals and complete order information.

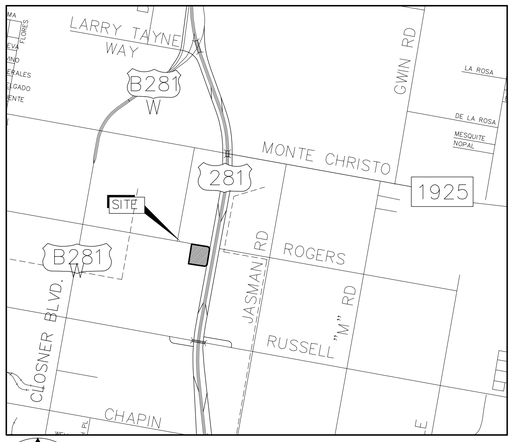
	N	Non-Compliance	Manufacturer shall list all items that do not comply with the specifications. If in full compliance, tab may be omitted.
	O	Cost of Ownership	Document cost of ownership as defined in the specification. Identify energy costs for operating the luminaires. Maintenance cost for the system must be included. All costs should be based on 25 Years
	P	Environmental Light Control Design	Environmental glare impact scans must be submitted showing the maximum candela from the field edge on a map of the surrounding area until 500 candela or less is achieved.

The information supplied herein shall be used for the purpose of complying with the specifications for North Park Softball. By signing below I agree that all requirements of the specifications have been met and that the manufacturer will be responsible for any future costs incurred to bring their equipment into compliance for all items not meeting specifications and not listed in the Non-Compliance section.

Manufacturer: _____ **Signature:** _____

Contact Name: _____ **Date:** _____/_____/_____

Contractor: _____ **Signature:** _____



LOCATION MAP:
N.T.S.

PROJECT CONTACTS:

CIVIL ENGINEERING FIRM:

SDI ENGINEERING, L.L.C.
5602 E. IOWA RD.
EDINBURG, TEXAS 78542
ISAEL POSADAS, P.E.
PHONE: (956) 287-1818
FAX: (956) 287-3697
E-MAIL: info@sdi-engineering.com

E.E.D.C.
NORTH PARK SPORT COMPLEX IMPROVEMENTS

EDINBURG ECONOMIC DEVELOPMENT CORPORATION

JORGE LUIS SALINAS	BOARD PRESIDENT
MIKE FARIAS	VICE PRESIDENT, SECRETARY-TREASURER
MAYOR RICHARD MOLINA	DIRECTOR
NORMA RAMIREZ	DIRECTOR
SONIA ENRIQUEZ	DIRECTOR

NOTE:

CONTRACTORS SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES FOUND ON THESE SET OF DRAWINGS, PRIOR TO ANY CONSTRUCTION.

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
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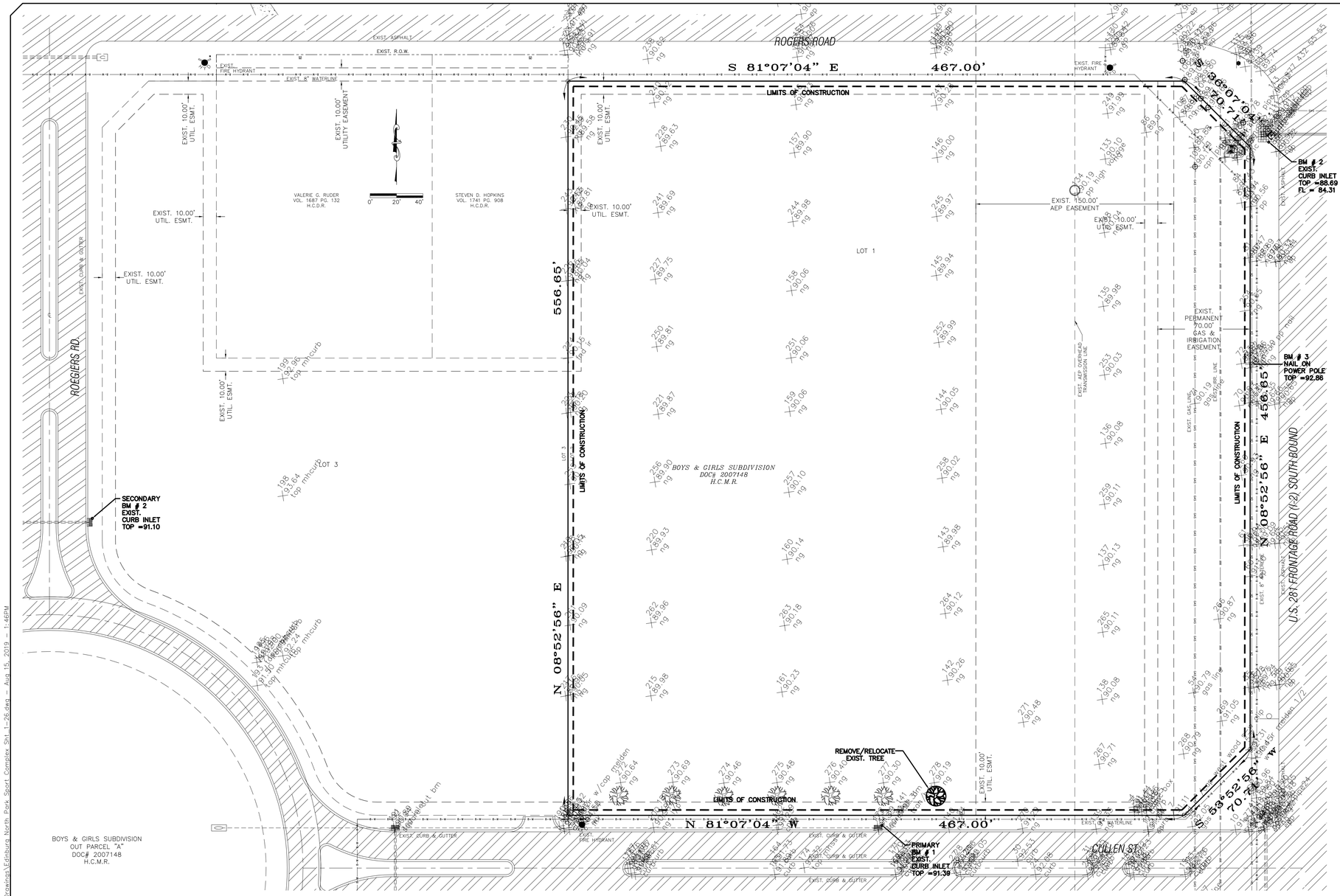
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

STATE OF TEXAS
ISAEL POSADAS
89435
LICENSED PROFESSIONAL ENGINEER

TECHNICAL APPROVAL ON THIS DOCUMENT WAS AUTHORIZED BY ISAEL POSADAS, P.E. No. 89435, ON AUGUST 15, 2019. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION OF THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

INDEX TO SHEETS:



GENERAL NOTES:

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING PUBLIC OR PRIVATE UTILITIES PRIOR TO CONSTRUCTION. LOCATIONS AND GRADES OF EXISTING UNDERGROUND UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REPAIRS TO DAMAGED LINES AT NO ADDITIONAL COST TO THE OWNER.

2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FAMILIARIZING HIMSELF WITH THE JOBSITE.

3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SAFEGUARDING AND PROTECTING ALL MATERIAL AND EQUIPMENT STORED ON THE JOBSITE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE STORAGE OF MATERIALS IN A SAFE AND WORKMANLIKE MANNER TO PREVENT INJURIES, DURING AND AFTER WORKING HOURS, UNTIL PROJECT COMPLETION.

4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL REQUIRED PERMITS AND CONSTRUCTION INSPECTIONS WITH THE PROPER REGULATORY AGENCIES, PRIOR TO BEGINNING CONSTRUCTION. COPIES OF ALL PERMITS SHALL BE SENT TO THE ENGINEER.

5. THE DRAWINGS SHOW AS MUCH INFORMATION AS CAN BE REASONABLY OBTAINED FROM ON THE GROUND OBSERVATION AND EXISTING CONSTRUCTION DRAWINGS REGARDING THE ENTIRE TOPOGRAPHY, CONTOURS, SUB-SURFACE SOILS, AS WELL AS THE LOCATION AND NATURE OF PIPELINES, STORM SEWERS, WATERLINES, NATURAL GAS LINES, UNDERGROUND CABLES, ETC. HOWEVER, THE ACCURACY OF OR COMPLETENESS OF SUCH INFORMATION IS NOT GUARANTEED.

6. CONTRACTOR SHALL COMPLY WITH ALL OCCUPATIONAL SAFETY AND HEALTH ACT (O.S.H.A.) REGULATIONS.

7. ALL WORK IS TO BE DONE IN ACCORDANCE WITH APPLICABLE NATIONAL, STATE MUNICIPAL AND LOCAL CODES.

8. IT IS THE CONTRACTOR'S RESPONSIBILITY TO SUPERVISE AND COORDINATE ALL WORK TO INSURE THE PROPER EXECUTION, ALL WORK IS TO BE ACCOMPLISHED IN A NEAT, WORKMAN LIKE MANNER, AND ALL EXCESS MATERIALS, TRASH AND DEBRIS, ETC., SHALL BE REMOVED FROM THE JOB BY THE CONTRACTOR, AT HIS EXPENSE.

9. THE CONTRACTOR SHALL KEEP ALL STREETS FREE OF DIRT, MUD, ETC. DURING THE COURSE OF CONSTRUCTIONS.

10. EXISTING PAVEMENTS, CURBS, SIDEWALKS, AND DRIVEWAYS DAMAGED OR REMOVED DURING CONSTRUCTION SHALL BE REPLACED TO CITY STANDARDS.

11. CONDITION OF THE ROAD AND/OR RIGHT-OF-WAY, UPON COMPLETION OF JOB, SHALL BE AS GOOD AS OR BETTER THAN THE CONDITION PRIOR TO STARTING WORK.

12. BACKFILL TO TOP OF NEW PAVEMENT OR CURBS WITH CLEAN SOIL FREE OF CLODS. ALL DISTURBED AREAS AND AREAS REQUIRING GRADING SHALL BE FINE GRADED REMOVE ALL TRASH/DEBRIS AND PROVIDE A SMOOTH SURFACE FOR PROPER TURF MANAGEMENT. HYDROMULCH DISTURBED AREAS NOT NOTED TO BE SOLID SOD OR AS DIRECTED BY THE ENGINEER.

13. CONTRACTOR SHALL EXERCISE CARE IN REMOVING/TRANSPORTING ANY ITEMS DEEMED SALVAGEABLE BY OWNER.

14. ANY ITEM DAMAGED OR UNSUITABLE FOR USE SHALL BE REPLACED AT CONTRACTOR'S EXPENSE.

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FILE NAME:	
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TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
DEMOLITION & CLEARING AREAS

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
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TBPE REG. NO. F-13016

SCALE:	FULL:	1" = 40'
	HALF:	N.T.S.

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STATE OF TEXAS
ISAEL POSADAS
89435
LICENSED PROFESSIONAL ENGINEER

ISAEL POSADAS 89435 8/15/19

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DATE: 8/15/19

SHEET NO.: 1 OF 37

ROGERS ROAD

S 81°07'04" E 467.00'

EXIST. R.O.W.

EXIST. 8" WATERLINE

EXIST. FIRE HYDRANT

EXIST. 10.00' UTIL. ESMT.

0' 15' 30'

VALERIE G. RUDER
VOL. 1687 PG. 132
H.C.D.R.

STEVEN D. HOPKINS
VOL. 1741 PG. 908
H.C.D.R.

556.65'

BOYS & GIRLS SUBDIVISION
DOC# 2007148
H.C.M.R.
LOT 3

N 08°52'56" E

SEE SHEET 12 FOR 5.0' PERIMETER SIDEWALK IMPROVEMENTS

SEE SHEET 12 FOR WALKING TRAIL IMPROVEMENTS

EXIST. 150.00' AEP EASEMENT

EXIST. PERMANENT 70.00' DRAINAGE & IRRIGATION EASEMENT

S 36°07'04" E 70.71'

BM # 2
EXIST. CURB INLET
TOP =88.69

BM # 3
NAIL ON POWER POLE
TOP =92.66

SEE SHEET 9 FOR SOFTBALL DIMENSIONS

SEE SHEET 8 FOR BLEACHERS IMPROVEMENTS

SEE SHEET 19 FOR FLAG POLE

SEE SHEET __ FOR FOOTBALL DIMENSIONS

SEE SHEET 9 FOR BASKETBALL COURT DIMENSIONS

PROP. SKATE PAD (NOT IN THIS CONTRACT)

SEE ARCH'S AND MEP PLANS FOR RESTROOMS & CONCESSION IMPROVEMENTS

SEE SHEET 5 & 6 FOR CONCRETE WALKWAY IMPROVEMENTS

FITNESS STATIONS (ALT No. 2)

SEE MEP PLANS FOR ELECTRICAL SITE

SEE SHEET 5 FOR SPLASH PAD (ALT No. 1)

SEE SHEET 5 FOR PLAYGROUND DIMENSIONS

SEE SHEET 31 FOR MONUMENT SIGN IMPROVEMENTS (ALT No. 5)

SEE SHEET 36 FOR SPLASH PAD BUILDING (ALT No. 1)

SEE SHEET 3 FOR PARKING LOT IMPROVEMENTS

SEE SHEET 3 FOR PARKING LOT IMPROVEMENTS (ALT No. 3)

SEE SHEET 26 FOR DUMPSTER DETAILS

SEE SHEET 12 FOR 5.0' PERIMETER SIDEWALK IMPROVEMENTS

N 08°52'56" E 456.65'

U.S. 281 FRONTAGE ROAD (I-2) SOUTH BOUND

EXIST. 10.00' ELEC. ESMT.

EXIST. CURB & GUTTER

EXIST. FIRE HYDRANT

EXIST. 8" WATERLINE

S 53°52'56" W 70.71'

SEE SHEET 12 FOR 5.0' PERIMETER SIDEWALK IMPROVEMENTS

N 81°07'04" W 467.00'

PRIMARY
BM # 1
EXIST.
CURB INLET
TOP =91.39

CULLEN ST.

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TITLE:
EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
MASTER PLAN

SDI ENGINEERING, LLC
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TBPE REG. NO. F-13016

SCALE: FULL: 1" = 30'
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STATE OF TEXAS
ISAEL POSADAS
89435
LICENSED PROFESSIONAL ENGINEER
8/15/19

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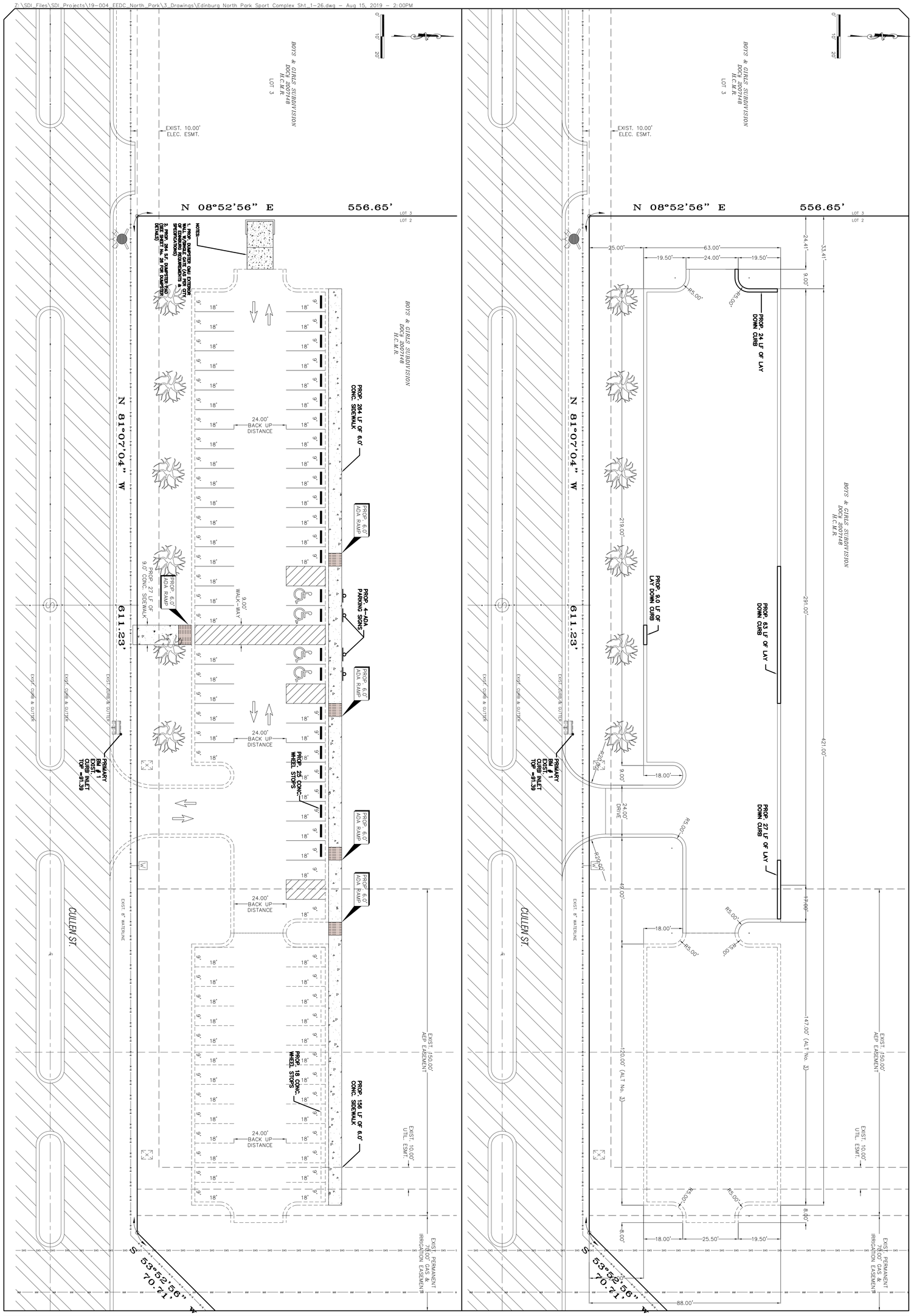
DATE: 8/15/19

SHEET NO.:
2 OF 37



SHEET NO: 3 OF 37	SCALE: HALF / FULL 1" = 40' N.T.S.	TBPE REG. NO. F-13016	DATE: 8/15/19

I, LEWIS PHILLIPS, A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF TEXAS, HEREBY CERTIFY THAT THE ABOVE PLANS WERE PREPARED UNDER MY SUPERVISION IN ACCORDANCE WITH THE REQUIREMENTS OF THE TEXAS ENGINEERING PRACTICE ACT.

LEWIS PHILLIPS 89435 LICENSED PROFESSIONAL ENGINEER

8/15/19

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TBPE REG. NO. F-13016

TITLE:

EDINBURG ECONOMIC DEVELOPMENT CORP

NORTH PARK SPORT COMPLEX

PARKING LOT IMPROVEMENTS

FILE NAME:	
DATE:	3/2/19
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DESIGNED BY:	IF
DRAWN BY:	IF
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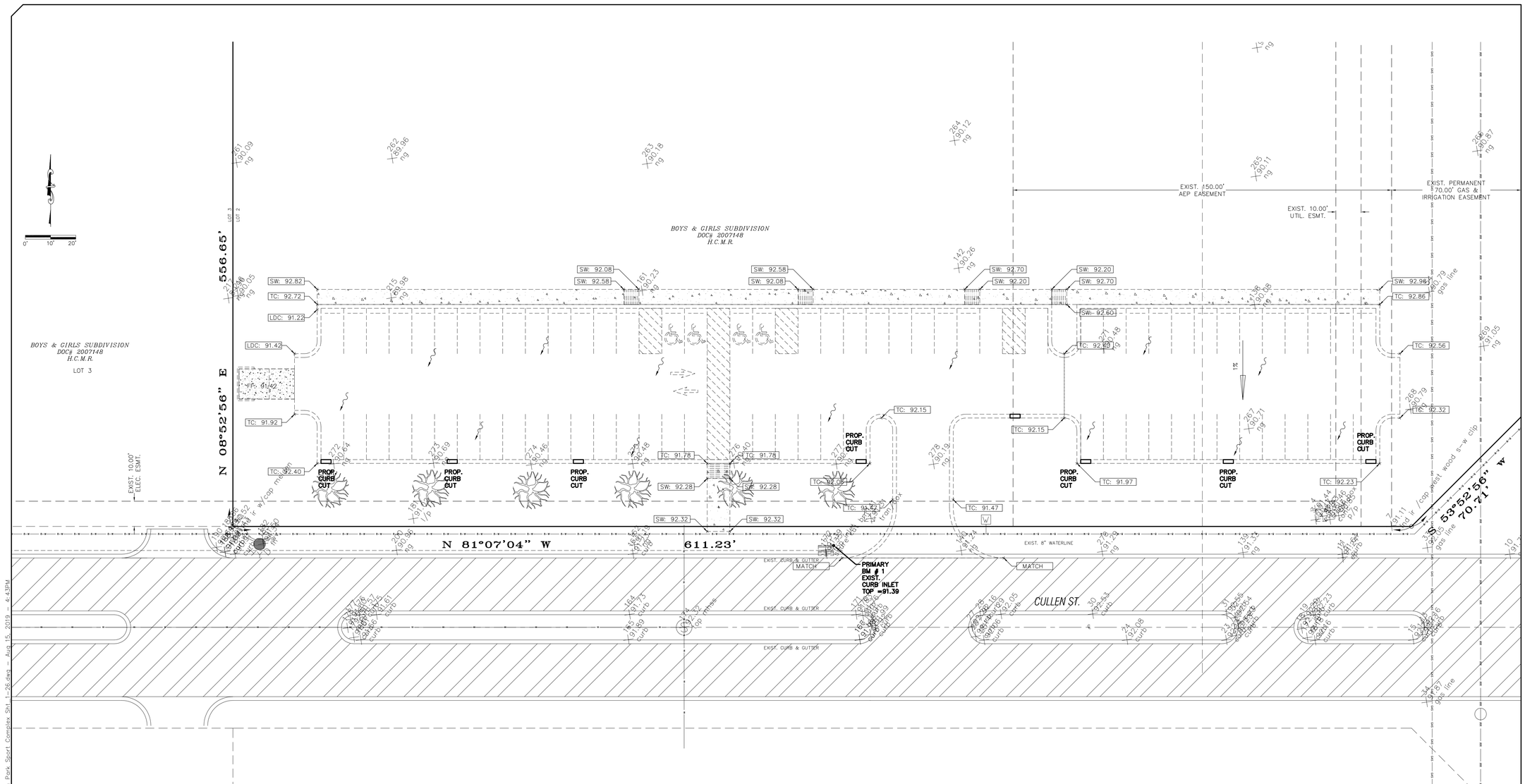

GENERAL NOTES:

1. SEE SHEET No. 3 FOR PARKING LOT DIMENSIONS.
2. SEE SHEET No. 3 FOR PARKING LOT STRIPING.
2. SEE SHEET No. 4 FOR PARKING LOT DRAINAGE IMPROVEMENTS.
3. SEE SHEET No. 5 FOR PLAYSCAPE, SPLASH PAD AND RESTROOM & CONCESSION STAND DIMENSIONS.
6. SEE SHEET No. 6 FOR WALKWAY DIMENSIONS.
7. SEE SHEET No. 5 FOR ELECTRICAL SITE DIMENSIONS.
8. SEE SHEET No. 7 FOR PLAYSCAPE, SPLASH PAD AND RESTROOM & CONCESSION STAND GRADING PLAN.
9. SEE SHEET No. 8 FOR BLEACHERS GRADING PLAN.
10. SEE SHEET No. 9 FOR BASKETBALL, SOFTBALL FIELD & FOOTBALL FIELD IMPROVEMENTS.
11. SEE SHEET No. 10 FOR BASKETBALL, SOFTBALL FIELD & FOOTBALL FIELD GRADING PLAN.
12. SEE SHEET No. 11 FOR UTILITY MASTER PLAN.
13. SEE SHEET No. 12 FOR WALKING TRAIL & PERIMETER SIDEWALK.
14. SEE SHEET No. 13 FOR WALKING TRAIL & SIDEWALK GRADING.
15. SEE SHEET No. 14 FOR OVERALL DRAINAGE IMPROVEMENTS.
16. SEE SHEET No. 15 FOR MASTER IRRIGATION IMPROVEMENTS.
17. SEE SHEET No. 16 FOR LANDSCAPING & IRRIGATION IMPROVEMENTS.
18. SEE SHEET No. 17 & 18 FOR LANDSCAPING & IRRIGATION DETAILS.
18. SEE SHEET No. 17 & 18 FOR LANDSCAPING & IRRIGATION DETAILS.
19. SEE SHEET No. 19 FOR FLAGPOLE, TRAIL & SOFTBALL DETAILS.
20. SEE SHEET No. 21 FOR PARKING LOT DETAILS.
21. SEE SHEET No. 22 FOR DRAINAGE DETAILS.
22. SEE SHEET No. 23 SANITARY SEWER DETAILS.
23. SEE SHEET No. 24 WATER DETAILS.
24. SEE SHEET No. 25 SIDEWALK DETAILS.
25. SEE SHEET No. 26 DUMPSTER DETAIL.

FILE NAME:	
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TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
PARKING LOT GRADING IMPROVEMENTS

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
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TBPE REG. NO. F-13016

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STATE OF TEXAS
ISAEL POSADAS
89435
LICENSED
PROFESSIONAL
ENGINEER

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DATE: 8/15/19

SHEET NO.: 4 OF 37

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GENERAL NOTES:

1. SEE SHEET No. 3 FOR PARKING LOT DIMENSIONS.
2. SEE SHEET No. 3 FOR PARKING LOT STRIPING.
2. SEE SHEET No. 4 FOR PARKING LOT DRAINAGE IMPROVEMENTS.
3. SEE SHEET No. 5 FOR PLAYSCAPE, SPLASH PAD AND RESTROOM & CONCESSION STAND DIMENSIONS.
6. SEE SHEET No. 6 FOR WALKWAY DIMENSIONS.
7. SEE SHEET No. 5 FOR ELECTRICAL SITE DIMENSIONS.
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9. SEE SHEET No. 8 FOR BLEACHERS GRADING PLAN.
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21. SEE SHEET No. 22 FOR DRAINAGE DETAILS.
22. SEE SHEET No. 23 SANITARY SEWER DETAILS.
23. SEE SHEET No. 24 WATER DETAILS.
24. SEE SHEET No. 25 SIDEWALK DETAILS.
25. SEE SHEET No. 26 DUMPSTER DETAIL.

0' 5' 10'

MATCH LINE "A"

PROP. 20'X30' ELECTRICAL YARD W/6.0' CHAILINK FENCE

SEE ARCH'S PLANS FOR RESTROOMS & CONCESSION

PROP. 5.00' CONC. SIDEWALK (PERIMETER)

PROP. SPLASH PAD (ALT No. 1)

SPLASH PAD BUILDING (ALT No. 1)

PROP. 5.00' CONC. SIDEWALK (PERIMETER)

PROP. PLAY SCAPE PROVIDED BY OWNER INSTALL BY CONTRACTOR

PROP. 90 LF PLAY SCAPE CONC. EDGING

PROP. 30 LF OF MASONRY RETAINING WALL

PROP. 30 LF OF MASONRY RETAINING WALL

PROP. 6.0' ADA RAMP

PROP. 6.0' ADA RAMP

FITNESS STATIONS (ALT No. 2)

PROP. CONC. BIKE RACK (SEE SHEET — FOR DETAILS)

FILE NAME:	
DATE:	3/2/19
SURVEYED BY:	
DESIGNED BY:	IF
DRAWN BY:	IF
REVISED BY:	IP
CHECKED BY:	IP

TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
WALKWAY, PLAYSCAPE & SPLASH

SDI ENGINEERING, LLC
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SCALE: FULL: 1" = 40' HALF: N.T.S.

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STATE OF TEXAS ISAEL POSADAS 89435 LICENSED PROFESSIONAL ENGINEER

Isael Posadas 8/15/19

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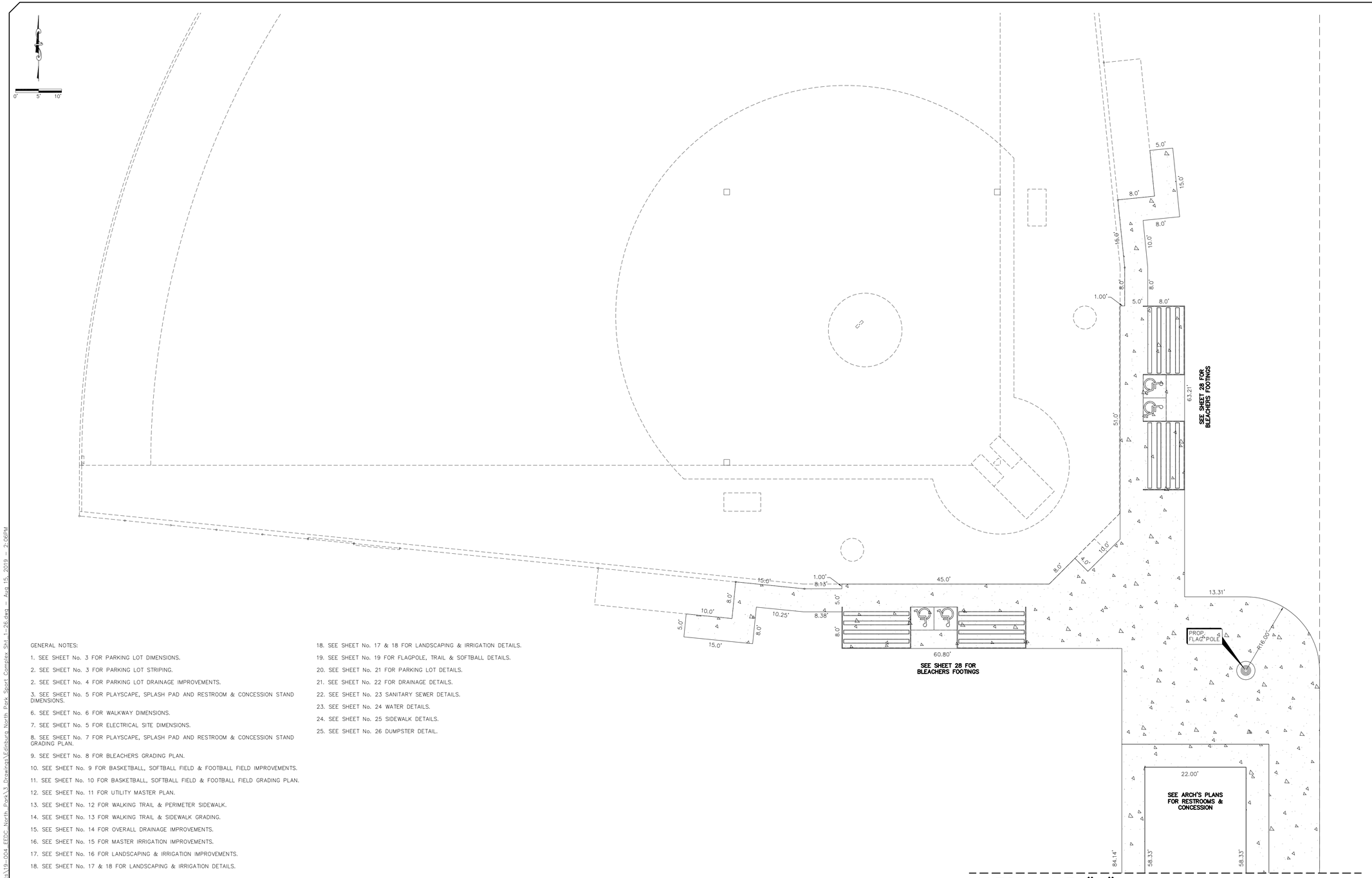

GENERAL NOTES:

1. SEE SHEET No. 3 FOR PARKING LOT DIMENSIONS.
2. SEE SHEET No. 3 FOR PARKING LOT STRIPING.
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25. SEE SHEET No. 26 DUMPSTER DETAIL.

FILE NAME:	
DATE:	3/2/19
SURVEYED BY:	
DESIGNED BY:	IF
DRAWN BY:	IF
REVISED BY:	IP
CHECKED BY:	IP

TITLE:
EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
CONC. WALKWAY DIMENSIONS

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE: FULL:	1" = 40'
SCALE: HALF:	N.T.S.

TBPE REG. NO. F-13016

STATE OF TEXAS
ISAEL POSADAS
89435
LICENSED PROFESSIONAL ENGINEER

ISAEL POSADAS 89435 LICENSED PROFESSIONAL ENGINEER 8/15/19

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DATE: 8/15/19

SHEET NO.:
6 OF 37

Z:\SDI Files\SDI Projects\19-004 EEDC North Park\3 Drawings\Edinburg North Park Sport Complex Sht 1-26.dwg - Aug 15, 2019 - 2:06PM

0' 5' 10'

GENERAL NOTES:

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25. SEE SHEET No. 26 DUMPSTER DETAIL.

MATCH LINE "A"

256 90.02 rig
FF: 93.28
256 89.58 rig
257 90.10 rig
220 89.93 rig
SW: 92.38
EL: 92.28
180 90.14 rig
SW: 93.28
EL: 93.28
FF: 92.68
SW: 92.68
FF: 92.79
SW: 92.88
SW: 92.72
SW: 92.58
SW: 92.69
262 89.96 rig
263 90.18 rig
264 90.02 rig
142 90.26 rig
SW: 92.70
FF: 92.73
SW: 92.82
SW: 92.72
215 88.09 rig
SW: 92.08
SW: 92.58
161 90.23 rig
SW: 92.48
SW: 91.98
SW: 92.20
SW: 92.60
SW: 92.10

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TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
GRADING IMPROVEMENTS

SCALE: FULL: 1" = 40'
HALF: N.T.S.

TBPE REG. NO. F-13016

STATE OF TEXAS
ISAEL POSADAS
89435
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8/15/19

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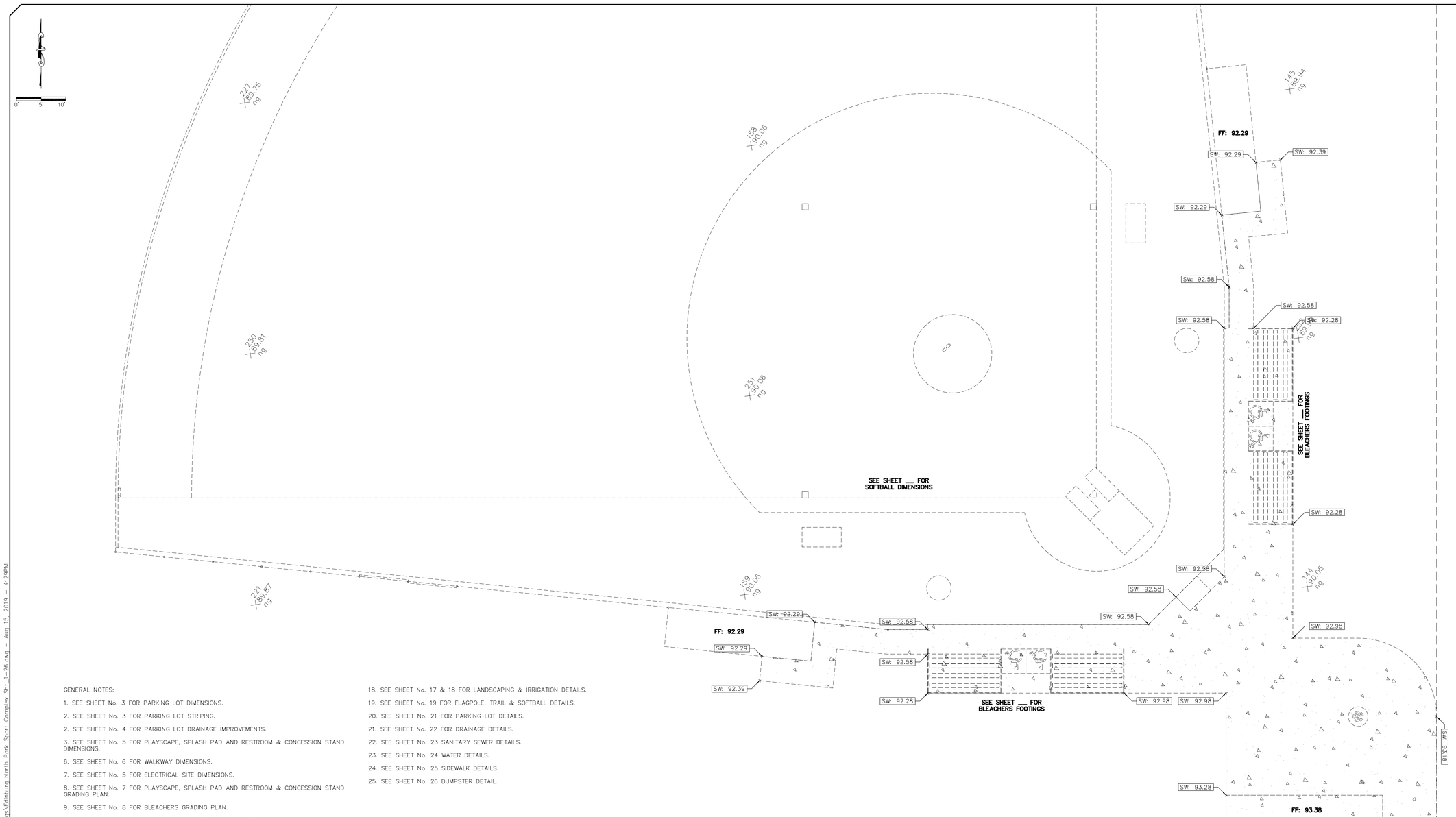

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NORTH PARK SPORT COMPLEX
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DATE: 8/15/19

SHEET NO.: 8 OF 37

ROGERS ROAD

S 81°07'04" E 467.00'

EXIST. R.O.W.

EXIST. FIRE HYDRANT

EXIST. 8" WATERLINE

EXIST. 10.00' UTIL. ESMT.

EXIST. 150.00' AEP EASEMENT

EXIST. PERMANENT 70.00' C.O.E. IRRIGATION EASEMENT

EXIST. FIRE HYDRANT

WV

S 36°07'04" E 70.71'

BM # 2
EXIST. CURB INLET
TOP =88.69

BM # 3
NAIL ON POWER POLE
TOP =92.86

VALERIE G. RUDER
VOL. 1687 PG. 132
H.C.D.R.

STEVEN D. HOPKINS
VOL. 1741 PG. 908
H.C.D.R.

556.65'

N 08°52'56" E

PROP. 20.0' HIGH STEEL FOUL POLE PAINTED (TYP.)

NEW 6'-0" HIGH CHAIN LINK FENCE

PROP. ELECTRICAL SCOREBOARD

R200.0'

15.0' POTEET RED SAND/CLAY MIX WARNING TRACK

PROP. 8.0' HIGH OUTFIELD CHAINLINK FENCE

140.00'

R200.00'

25.0'

8.0'

VISITOR'S DUGOUT

30.0'

60.00'

R240.00'

R50.00'

60.00'

COACH'S BOX

END OF BACKSTOP

PROP. 20.0' HIGH STEEL FOUL POLE PAINTED (TYP.)

60.00'

60.00'

COACH'S BOX

20.0' HIGH NET W/BACKSTOP

140.00'

60.00'

NEW 6'-0" HIGH CHAIN LINK FENCE

43.0'

HOME DUGOUT

30.0'

END OF BACKSTOP

R15.00'

45.0'

20.0'

PROP. 4.0'x6.0' SCORE KEEPER

NEW 10'-0" WIDE SLIDING GATE @ CHAIN LINK FENCE

PROP. BASKETBALL COURT (SEE ARCH'S PLANS FOR FOUNDATION)

94.00'

174.37'

50.00'

108.95'

360.00'

160.00'

40.00'

28.59'

10.00'

160.00'

104.00'

EXIST. 10.00' UTIL. ESMT.

EXIST. 8" WATERLINE

EXIST. ASPHALT

U.S. 281 FRONTAGE ROAD (I-2) SOUTH BOUND

S 53°52'56" W 70.71'

N 08°52'56" E 456.65'

N 81°07'04" W 467.00'

EXIST. CURB & GUTTER

EXIST. CURB & GUTTER

PRIMARY BM # 1
EXIST. CURB INLET
TOP =91.39

CULLEN ST.

BOYS & GIRLS SUBDIVISION
DOC# 2007148
H.C.M.R.

LOT 3

GENERAL NOTES:

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Z:\SDI Files\SDI Projects\19-004 EDC North Park\3 Drawings\Edinburg North Park Sport Complex Sht 1-26.dwg - Aug 15, 2019 - 2:08PM

FILE NAME:

DATE: 3/2/19

SURVEYED BY:

DESIGNED BY: IF

DRAWN BY: IF

REVISED BY: IP

CHECKED BY: IP

TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
SOFTBALL FIELD DIMENSION

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE: FULL: 1" = 30'
HALF: N.T.S.

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STATE OF TEXAS
ISAEL POSADAS
89435
LICENSED PROFESSIONAL ENGINEER

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SHEET NO.: 9 OF 37

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BOYS & GIRLS SUBDIVISION
DOC# 2007148
H.C.M.R.

LOT 3

ROGERS ROAD

S 81°07'04" E 467.00'

N 81°07'04" W 467.00'

N 08°52'56" E 556.65'

S 08°52'56" E 456.65'

S 53°52'56" W 70.71'

VALERIE G. RUDER
VOL. 1687 PG. 132
H.C.D.R.

STEVEN D. HOPKINS
VOL. 1741 PG. 908
H.C.D.R.

EXIST. 10.00' UTIL. ESMT.

EXIST. 8" WATERLINE

EXIST. FIRE HYDRANT

EXIST. 150.00' AEP EASEMENT

EXIST. PERMANENT 70.00' ROW & IRRIGATION EASEMENT

SLOPE

EL: 90.98
EL: 91.58
EL: 92.08
EL: 92.29
EL: 92.05
EL: 91.89
EL: 92.41

FF: 00.00

BM # 2
EXIST. CURB INLET
TOP =88.69

BM # 3
NAIL ON POWER POLE
TOP =92.66

PRIMARY BM # 1
EXIST. CURB INLET
TOP = 91.39

EXIST. CURB & GUTTER

CULLEN ST.

U.S. 281 FRONTAGE ROAD (1-2) SOUTH BOUND

EXIST. 6" WATERLINE

EXIST. DRIVEWAY

EXIST. 10.00' UTIL. ESMT.

0' 15' 30'

Z:\SDI Files\SDI Projects\19-004 EEDC North Park\3 Drawings\Edinburg North Park Sport Complex Sht 1-26.dwg - Aug 15, 2019 - 3:45PM

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NORTH PARK SPORT COMPLEX
SOFTBALL & PRACTICE FIELD GRADING

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10 OF 37

ROGERS ROAD

S 81°07'04" E 467.00'

EXIST. R.O.W.

EXIST. FIRE HYDRANT

EXIST. 8" WATERLINE

EXIST. 10.00' UTIL. ESMT.

0' 15' 30'

VALERIE G. RUDER
VOL. 1687 PG. 132
H.C.D.R.

STEVEN D. HOPKINS
VOL. 1741 PG. 908
H.C.D.R.

556.65'

GENERAL NOTES:

1. SEE M.E.P. PLANS FOR PARKING LIGHTS IMPROVEMENTS & DETAILS.

2. CONTRACTOR SHALL FIELD VERIFY EXIST. ELECTRICAL SERVICE/EXIST. POWER AND SHALL INCLUDE COST FOR UPGRADES OR REPLACEMENT OF WIRE, CONDUIT CONNECTORS, BREAKER, ALL NECESSARY TO COMPLETE WORK.

3. CONTRACTOR SHALL INCLUDE ALL COST TO EXTEND CONDUIT AND WIRING TO NEW LIGHTS.

4. REFER TO MEP PLANS FOR POLE & FIXTURE SCHEDULE.

5. LOCATIONS OF ALL LIGHTS TO BE FIELD VERIFIED W/ ENGINEER PRIOR TO INSTALLATION.

6. PROP. ELECTRICAL SITE YARD, SHALL HAVE A 6.0' HEIGHT CHAINLINK FENCE ALL AROUND. SUBMITTALS SHALL BE PREPARED TO PROJECT ENGINEER FOR APPROVAL.

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BOYS & GIRLS SUBDIVISION
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LOT 3

N 08°52'56" E

S 36°07'04" E 70.71'

BM # 2
EXIST. CURB INLET
TOP =88.69

BM # 3
NAIL ON POWER POLE
TOP =92.66

EXIST. 150.00' AEP EASEMENT

EXIST. 10.00' UTIL. ESMT.

EXIST. PERMANENT 70.00' DRAINAGE & IRRIGATION EASEMENT

PROP. LIGHT

(SEE SHEET 15 FOR IRRIGATION IMPROVEMENTS)

EXIST. FIRE HYDRANT

CONNECT SERVICE TO BUILDING (SEE MEP PLANS FOR DETAILS)

INSTALL SANITARY SEWER CLENOUT FL: 00.00

SPLASH PAD BUILDING (FUTURE)

SPLASH PAD (FUTURE)

INSTALL 2" FLUSH VALVE

INSTALL 8" SANITARY SEWER PLUG FL: 00.00

INSTALL SANITARY SEWER MANHOLE TOP: 00.00 FL: 00.00

PROP. 97 L.F. OF 2" WATER SERVICE LINE

PROP. 92 L.F. OF 4" SANITARY SEWER SERVICE LINE

PROP. 310 LF OF 6" SANITARY SEWER SERVICE CONNECTION

PROP. 215 LF OF DOMESTIC WATER SERVICE CONNECTION

INSTALL BACK FLOW & 2" WATER METER

CONNECT TO EXIST. CITY OF EDINBURG 8" WATER LINE

PROP. 156 L.F. OF 4" SANITARY SEWER SERVICE LINE

EXIST. CURB & GUTTER

EXIST. FIRE HYDRANT

N 81°07'04" W 467.00'

EXIST. 8" WATERLINE

S 53°52'56" W 70.71'

EXIST. SANITARY SEWER SERVICE CONNECTION (APPROX. LOCATION)

PRIMARY BM # 1
EXIST. CURB INLET
TOP =91.39

CULLEN ST.

U.S. 281 FRONTAGE ROAD (I-2) SOUTH BOUND

INSTALL BACK FLOW & 2" WATER METER (BY OWNER)

EXIST. NORTH R.O.W.

CONNECT DOMESTIC WATER SERVICE TO EXIST. 8" WATER LINE

EXIST. 8" CITY OF EDINBURG WATERLINE

DETAIL "A"

Z:\SDI Files\SDI Projects\19-004 EEDC North Park\3 Drawings\Edinburg North Park Sport Complex Sht 1-26.dwg - Aug 15, 2019 - 2:10PM

FILE NAME:	
DATE:	3/2/19
SURVEYED BY:	
DESIGNED BY:	IF
DRAWN BY:	IF
REVISED BY:	IP
CHECKED BY:	IP

TITLE:
EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
UTILITY MASTER PLAN

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE: FULL: 1" = 30'
HALF: N.T.S.

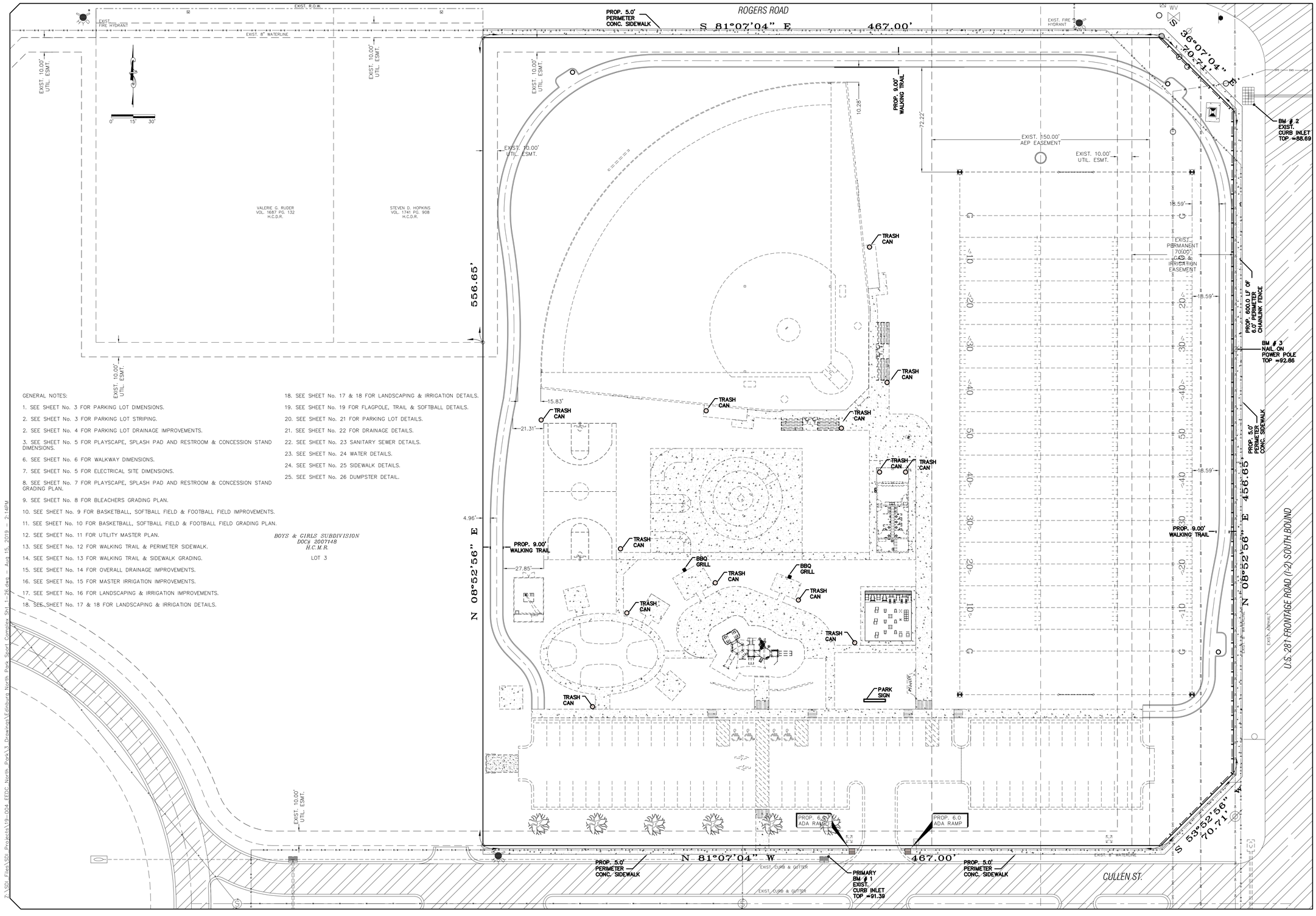
TBPE REG. NO. F-13016

STATE OF TEXAS
ISAEL POSADAS
89435
REGISTERED
PROFESSIONAL
ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY ISAEL POSADAS, P.E. No. 89435 ON AUGUST 15, 2019. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION OF THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

DATE: 8/15/19

SHEET NO.:
11 OF 37



GENERAL NOTES:

1. SEE SHEET No. 3 FOR PARKING LOT DIMENSIONS.
2. SEE SHEET No. 3 FOR PARKING LOT STRIPING.
2. SEE SHEET No. 4 FOR PARKING LOT DRAINAGE IMPROVEMENTS.
3. SEE SHEET No. 5 FOR PLAYSCAPE, SPLASH PAD AND RESTROOM & CONCESSION STAND DIMENSIONS.
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23. SEE SHEET No. 24 WATER DETAILS.
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25. SEE SHEET No. 26 DUMPSTER DETAIL.

Z:\SDI Files\SDI Projects\19-004 EEDC North Park\3 Drawings\Edinburg North Park Sport Complex Sht 1-26.dwg - Aug 15, 2019 - 2:14PM

FILE NAME:	
DATE:	3/2/19
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TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
WALKING TRAIL & PERIMETER SIDEWALK

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
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TBPE REG. NO. F-13016

SCALE: FULL: 1" = 30' HALF: N.T.S.

TBPE REG. NO. F-13016

STATE OF TEXAS ISAEL POSADAS 89435 LICENSED PROFESSIONAL ENGINEER

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SHEET NO.: 12 OF 37

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24. SEE SHEET No. 25 SIDEWALK DETAILS.
25. SEE SHEET No. 26 DUMPSTER DETAIL.

BOYS & GIRLS SUBDIVISION
DOC# 2007148
H.C.M.R.
LOT 3

ROGERS ROAD

S 81°07'04" E 467.00'

N 81°07'04" W 467.00'

N 08°52'56" E 556.65'

S 08°52'56" W 456.65'

S 36°07'04" E 70.71'

S 53°52'56" W 70.71'

U.S. 281 FRONTAGE ROAD (I-2) SOUTH BOUND

CULLEN ST.

VALERIE G. RUDER
VOL. 1687 PG. 132
H.C.D.R.

STEVEN D. HOPKINS
VOL. 1741 PG. 908
H.C.D.R.

EXIST. 10.00' UTIL. ESMT.

EXIST. 50.00' AEP EASEMENT

EXIST. PERMANENT 70.00' R.O.W. & IRRIGATION EASEMENT

EXIST. 8" WATERLINE

EXIST. FIRE HYDRANT

PROP. 5.0' PERIMETER CONC. SIDEWALK

EXIST. CURB & GUTTER

EXIST. 8" WATERLINE

EXIST. ASPHALT

BM # 2
EXIST. CURB INLET
TOP =88.59
FL = 84.31

BM # 3
NAIL ON POWER POLE
TOP =92.86

PRIMARY BM # 1
EXIST. CURB INLET
TOP. =91.39

EL: 90.98 · EL: 91.25 · EL: 91.50 · EL: 92.38 · EL: 92.82 · EL: 92.96

SW: 90.98 · SW: 91.02 · SW: 91.06 · SW: 91.10 · SW: 91.15 · SW: 90.50 · SW: 92.90 · SW: 91.05 · SW: 90.47 · SW: 91.47 · SW: 91.42 · SW: 90.43

0' 15' 30'

FILE NAME:	
DATE:	3/2/19
SURVEYED BY:	
DESIGNED BY:	IF
DRAWN BY:	IF
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CHECKED BY:	IP

TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
WALKING TRAIL & SIDEWALK GRADING

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INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE: FULL:	1" = 30'
HALF:	N.T.S.

TBPE REG. NO. F-13016

STATE OF TEXAS · ISAEL POSADAS · 89435 · LICENSED PROFESSIONAL ENGINEER

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DATE: 8/15/19

SHEET NO.: 13 OF 37

Z:\SDI Files\SDI Projects\19-004 EEDC North Park\3 Drawings\Edinburg North Park Sport Complex Sht 1-26.dwg — Aug 15, 2019 — 5:01PM

GENERAL NOTES:

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VALERIE G. RUDER
VOL. 1687 PG. 132
H.C.D.R.

STEVEN D. HOPKINS
VOL. 1741 PG. 908
H.C.D.R.

AREAS	
ITEM	VOLUME
A1	13,420.00
A2	2,375.00
A3	7,569.00
A4	2,256.00
A5	7,569.00

DETENTION AREA DETAIL (TYP.)

SCALE: N.T.S.

BOYS & GIRLS SUBDIVISION
DOC# 2007148
H.C.M.R.
LOT 3

TOP VIEW OF GRATE

SCALE: N.T.S.

SIDEWALK DRAIN CHUTE

SCALE: N.T.S.

ROGERS ROAD

S 81°07'04" E 467.00'

S 36°07'04" E 70.71'

N 08°52'56" E 556.65'

N 08°52'56" E 456.65'

S 53°52'56" W 70.71'

N 81°07'04" W 467.00'

U.S. 281 FRONTAGE ROAD (I-2) SOUTH BOUND

CULLEN ST.

BM # 2
EXIST. CURB INLET
TOP: 88.69
INV (W): 86.93
FL: 84.31

BM # 3
NAIL ON POWER POLE
TOP =92.66

PRIMARY BM # 1
EXIST. CURB INLET
TOP =91.39
FL = 86.56
INV (N) = 87.06

FILE NAME:	
DATE:	3/2/19
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TITLE:
EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
OVERALL DRAINAGE IMPROVEMENTS

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TBPE REG. NO. F-13016

SCALE: FULL: 1" = 30'
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ISAEL POSADAS
89435
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

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SHEET NO.:
14 OF 37

Z:\SDI Files\SDI Projects\19-004 EEDC North Park\3 Drawings\Edinburg North Park Sport Complex Sht 1-26.dwg — Aug 15, 2019 - 5:02PM

ROGERS ROAD

S 81°07'04" E 467.00'

EXIST. R.O.W.

EXIST. FIRE HYDRANT

EXIST. 8" WATERLINE

EXIST. 10.00' UTIL. ESMT.

EXIST. FIRE HYDRANT

WV

S 36°07'04" E 70.71'

BM # 2
EXIST. CURB INLET
TOP =88.69

EXIST. 150.00' AEP EASEMENT

EXIST. 10.00' UTIL. ESMT.

EXIST. PERMANENT 70.00' G.S. & IRRIGATION EASEMENT

BM # 3
NAIL ON POWER POLE
TOP =92.66

GENERAL NOTES:

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VALERIE G. RUDER
VOL. 1687 PG. 132
H.C.D.R.

STEVEN D. HOPKINS
VOL. 1741 PG. 908
H.C.D.R.

BOYS & GIRLS SUBDIVISION
DOC# 2007148
H.C.M.R.

LOT 3

A01 A02 A03 A04 A05 A06 A07 A08 A09

PROP. 2" MAIN IRRIGATION LINE

HYDROMULCH

556.65'

N 08°52'56" E

N 08°52'56" E 456.65'

57.00'

2.00'

8.00'

1.00'

9.00'

2.50'

5.2'

N 81°07'04" W 467.00'

S 53°52'56" W 70.71'

EXIST. CURB & GUTTER

EXIST. 8" WATERLINE

EXIST. ASPHALT

PRIMARY
BM # 1
EXIST. CURB INLET
TOP =91.39

U.S. 281 FRONTAGE ROAD (I-2) SOUTH BOUND

CULLEN ST.

GENERAL NOTES:

1. DESIGN IS BASED UPON A MINIMUM FLOW OF 56 GPM AND A MINIMUM PRESSURE OF 52 PSI DOWNSTREAM OF BACKFLOW PREVENTION DEVICE. IF SUFFICIENT PRESSURE IS NOT AVAILABLE AT POINT-OF-CONNECTION INSTALL A BOOSTER PUMP. CONTACT A RAIN BIRD REPRESENTATIVE FOR THE APPROPRIATE PUMP FOR THE SITE.
2. ADDITIONAL LATERALS OUTSIDE DESIGNATED FIELD AREA MAY BE INSTALLED PROVIDED HYDRAULIC CAPABILITY OF SUPPLY IS NOT EXCEEDED.
3. SPRINKLER LOCATIONS ARE TO SCALE. PIPE LOCATIONS ARE DIAGRAMMATIC.
4. PROVIDE #55K-1 KEY (1" MALE OUTLET) AND SH-2 SWIVEL HOSE ELL FOR EACH QUICK COUPLING VALVE.
5. LOCATE IRRIGATION CONTROLLER ON BUILDING (LOCATE TO BE COORDINATED W/OWNER).
6. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ELECTRICAL SERVICE AND CONNECTION FROM ELECTRICAL POWER SYSTEM.
7. CONTRACTOR TO PROVIDE A DETAILED SUBMITTAL OF INSTALLATION PREPARED BY A LICENSED IRRIGATOR.
8. CONNECTION TO PUBLIC WATER SUPPLY MUST BE COORDINATED W/N.A.W.S.C. ALL COST FOR PERMITS SHALL BE INCLUDED IN BID.
9. PLANS REPRESENT A SCHEMATIC LAYOUT WITH MIN. PERFORMANCE REQUIREMENTS.
10. SEE SHEET No. __ FOR IRRIGATION DETAILS.

DESCRIPTION

- MAIN WATER MTER
- BACKFLOW PREVENTION DEVICE
- MAIN SHUT-OFF VALVE
- RAIN BIRD PGA OR PEB REMOTE CONTROL VALVE (SIZED AS SHOWN)
- RAIN BIRD 5LRC QUICK COUPLING VALVE
- RAIN BIRD FALCON 6504 FC
- QUICK COUPLE
- SPRAYER
- RAIN BIRD FALCON 6504 PC
- (A) RAIN BIRD ESP-LX MODULAR IRRIGATION CONTROLLER

A1 INDICATES CONTROLLER AND CONTROLLER STATION NUMBER
66 INDICATES LATERAL DISCHARGE IN GPM
2" INDICATES REMOTE CONTROL VALVE SIZE

MAINLINE PIPE: CLASS 200 PVC (SIZED AS SHOWN)

LATERAL PIPE: CLASS 200 PVC (SIZED AS SHOWN)

0' 15' 30'

Z:\SDI Files\SDI Projects\19-004 EEDC North Park\3 Drawings\Edinburg North Park Sport Complex Sht 1-26.dwg - Aug 15, 2019 - 2:16PM

FILE NAME:
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NORTH PARK SPORT COMPLEX
MASTER IRRIGATION IMPROVEMENTS

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STATE OF TEXAS
ISAEL POSADAS
89435
LICENSED PROFESSIONAL ENGINEER
8/15/19

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SHEET NO.: 15 OF 37

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0' 15' 30'

GENERAL NOTES:

1. LANDSCAPING SEEDING & AREAS WITH OUT SPRINKLES SHALL REQUIRE TEMPORARY SPRINKLE INSTALLATION FOR 80% GROWTH.

ORNAMENTAL / TREES / SHRUBS

	COMMON NAME	MIN. SIZE		COMMON NAME	MIN. SIZE
	LIVE OAK	3" CALIPER		TEXAS SAGE BUSH	3 GAL.
	CRAPE MYRTLE	3" CALIPER			

ROGERS ROAD

S 81°07'04" E 467.00'

EXIST. R.O.W.

EXIST. FIRE HYDRANT

EXIST. 8" WATERLINE

EXIST. FIRE HYDRANT

WV

S 36°07'04" E 70.71'

EXIST. 150.00' AEP EASEMENT

EXIST. 10.00' UTIL. ESMT.

SEEDING

EXIST. PERMANENT 70.00' DRAINAGE & IRRIGATION EASEMENT

556.65'

VALERIE G. RUDER VOL. 1687 PG. 132 H.C.D.R.

STEVEN D. HOPKINS VOL. 1741 PG. 908 H.C.D.R.

BOYS & GIRLS SUBDIVISION
DOC# 2007148
H.C.M.R.
LOT 3

N 08°52'56" E

SEEDING

SEEDING

SEEDING

SEEDING

N 08°52'56" E 456.65'

U.S. 281 FRONTAGE ROAD (I-2) SOUTH BOUND

EXIST. CROWN

S 53°52'56" W 70.71'

N 81°07'04" W 467.00'

EXIST. CURB & GUTTER

EXIST. CURB & GUTTER

EXIST. 8" WATERLINE

CULLEN ST.

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NORTH PARK SPORT COMPLEX
LANDSCAPING & IRR. IMPROVEMENTS

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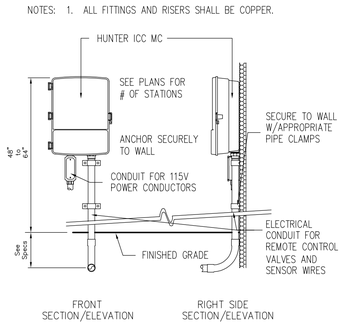
TBPE REG. NO. F-13016

ISAEL POSADAS 89435 LICENSED PROFESSIONAL ENGINEER

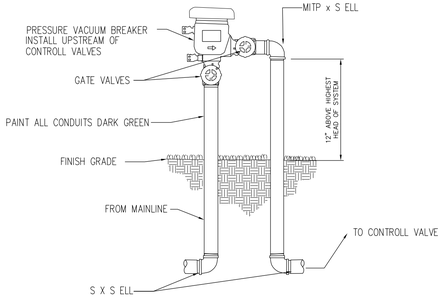
THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY ISAEL POSADAS, P.E. No. 89435 ON AUGUST 15, 2019. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION OF THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

DATE: 8/15/19

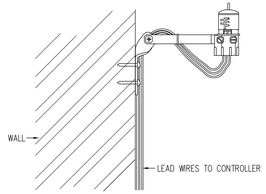
SHEET NO.: 16 OF 37



1 IRRIGATION CONTROLLER
SCALE: NTS

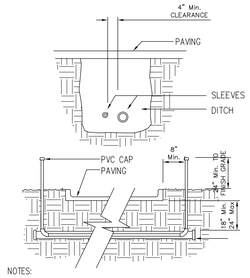


2 PRESSURE VACCUM BREAKER
SCALE: NTS



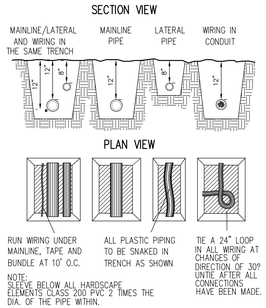
NOTE:
MOUNT SENSOR ON ANY SURFACE WHERE IT WILL BE EXPOSED TO UNOBSTRUCTED RAINFALL, BUT NOT IN THE PATH OF SPRINKLER SPRAY.

3 RAIN SENSOR
SCALE: NTS



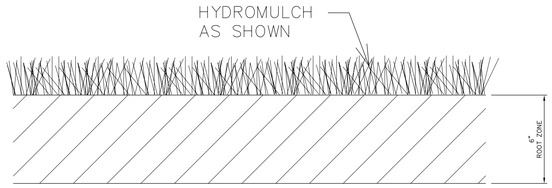
NOTES:
1. ALL PVC IRRIGATION SLEEVING TO BE CLASS 200.
2. ALL JOINTS TO BE SOLVENT WELDED AND WATERTIGHT.
3. WHERE THERE IS MORE THAN ONE SLEEVE, EXTEND SMALLER SLEEVE TO 24" MIN. ABOVE FINISH GRADE.
4. MECHANICALLY TAMP TO 95% PROCTOR.

4 IRRIGATION SLEEVING
SCALE: NTS



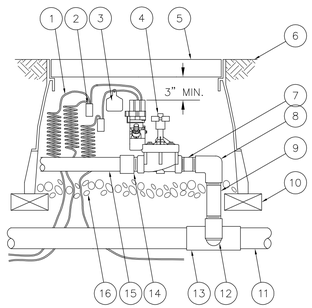
NOTE:
SLEEVE BELOW ALL HARDSCAPE ELEMENTS CLASS 200 PVC 2 TIMES THE DIA. OF THE PIPE WITHIN.

5 PIPE & WIRE TRENCHING
SCALE: NTS



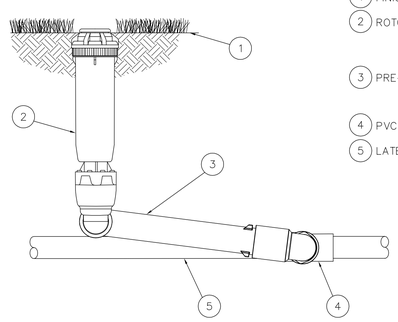
NOTE: ROOT ZONE MATERIAL SHALL BE COMPOSED OF CLEAN MATERIAL FROM ONSITE. COMPACT TO 90% MAX. DENSITY.

7 TYPICAL TURF SECTION
SCALE: NTS



1. 30-INCH LINEAR LENGTH OF WIRE, COILED
2. WATERPROOF CONNECTION RAIN BIRD SPLICE-1 (1 OF 2)
3. ID TAG: RAIN BIRD VID SERIES
4. REMOTE CONTROL VALVE: RAIN BIRD PESB-PRS-D WITH NP-HAN
5. VALVE BOX WITH COVER: RAIN BIRD VB-STD
6. FINISH GRADE/TOP OF MULCH
7. PVC SCH 80 NIPPLE (CLOSE)
8. PVC SCH 40 ELL
9. PVC SCH 80 NIPPLE (LENGTH AS REQUIRED)
10. BRICK (1 OF 4)
11. PVC MAINLINE PIPE
12. SCH 80 NIPPLE (2-INCH LENGTH, HIDDEN) AND SCH 40 ELL
13. PVC SCH 40 TEE OR ELL
14. PVC SCH 40 MALE ADAPTER
15. PVC LATERAL PIPE
16. 3.0-INCH MINIMUM DEPTH OF 3/4-INCH WASHED GRAVEL

8 ELECTRIC REMOTE-CONTROL VALVE
SCALE: NTS



1. FINISH GRADE
2. ROTOR POP-UP SPRINKLER: -HS
3. PRE-FABRICATED SWING JOINT:
4. PVC SCH 40 TEE OR ELL
5. LATERAL PIPE

9 ROTOR POP-UP SPRINKLER (FALCON 6504)
SCALE: NTS

GENERAL NOTES

1. CRONTACTOR SHALL BE RESPONSIBLE FOR VISITING SITE AND GETTING FAMILIAR WITH EXISTING CONDITIONS.

2. CONTRACTOR SHALL BE RESPONSIBLE FOR BECOMING FAMILIAR WITH ALL EXISTING UTILITIES AND MUST TAKE NECESSARY PRECAUTIONS TO AVOID DAMAGE DURING EXCAVATION. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE CAUSED AT SITE.

3. CONTRACTOR SHALL SCHEDULE ALL WORK AND FINISH IN A TIMELY MANNER.

4. ALL EQUIPMENT SHALL BE HUNTER OR RAINBIRD EQUIPMENT UNLESS OTHERWISE INDICATED.

5. LAWN SPRAY HEADS ARE 4" PRO-SPRAY INSTALLED AS PER DETAIL.

6. ELECTRIC CONTROL VALVES SHALL BE ICV INSTALLED AS PER DETAIL SHOWN. SIZE VALVE AS SHOWN ON PLANS. VALVES SHALL BE INSTALLED IN VALVE BOXES LARGE ENOUGH TO PERMIT MANUAL OPERATION, REMOVAL OF SOLENOID AND/OR VALVE COVER WITHOUT ANY EARTH EXCAVATION.

7. AUTOMATIC CONTROLLER SHALL BE INSTALLED AT LOCATION SHOWN. POWER (120V) SHALL BE LOCATED IN A JUNCTION BOX WITHIN (5') OF CONTROLLER LOCATION. POWER SUPPLY AND JUNCTION BOX TO BE PROVIDED BY OWNER.

8. ALL 24 VOLT VALVE WIRING IS TO BE UF 14 SINGLE CONDUCTOR. ALL WIRE SPLICES ARE TO BE PERMANENT AND WATER PROOF.

9. SLEEVES SHALL BE SUPPLIED/INSTALLED BY L.I.C.. SLEEVE MATERIAL SHALL BE SCHEDULE 40. SIZE SHALL BE 2" LARGER THAN PIPE BEING PROTECTED.

10. TEN DAYS PRIOR TO START OF CONSTRUCTION, CONTRACTOR SHALL VERIFY STATIC WATER PRESSURE. IF STATIC PRESSURE IS LESS THAN 55 PSI, DO NOT START WORK UNTIL NOTIFIED TO DO SO BY OWNER.

11. ALL MAINLINE PIPING SHALL HAVE A MINIMUM OF 12 INCHES OF COVER. LATERAL PIPING SHALL HAVE 8" OF COVER. ALL PIPING UNDER PAVING SHALL HAVE A MINIMUM OF 18 INCHES OF COVER.

12. THE IRRIGATION CONTRACTOR SHALL SELECT THE PROPER ARC AND RADIUS FOR EACH NOZZLE TO INSURE 100% AND PROPER COVERAGE OF ALL LAWN AREAS AND PLANT MATERIAL. ALL NOZZLES IN PARKING LOTS AND PLANTING BEDS SHALL BE LOW ANGLE TO MINIMIZE OVERSPRAY ON PAVEMENT SURFACES. NO WATER WILL BE ALLOWED TO SPRAY ON BUILDING.

13. THE IRRIGATION CONTRACTOR SHALL WARRANTY ALL SYSTEM COMPONENTS FOR A PERIOD OF ONE YEAR.

14. AS BUILT – PROVIDE OWNER WITH A COMPLETE SET OF AS-BUILTS DREAWINGS AT FINAL ACCEPTANCE.

15. SENSORS – INSTALL RAIN SHUT-OFF SENSORS IN ELEVATED AND EXPOSED EXTERIOR LOCATIONS CLEAR OF TREES AND OTHER OBSTRUCTIONS.

16. LATERAL PIPE AND SLEEVES TO TREE BUBBLERS AND DRIP ZONES ARE OMMITED FOR GRAPHIC CLARITY. CONNECT TREE BUBBLERS AND DRIP ZONES TO VALVES SHOWN WITH CLASS 200 PVC PIPE. ALL LATERAL SHALL BE SIZED TO ALLOW MAXIMUM FLOW VELOCITY OF FIVE FEET PER SECOND.

17. L.I.C. TO COORDINATE WITH OWNER FOR WATERING SCHEDULE.

18. ADD 2" SCHEDULE 40 SLEEVE TO ALL MAINLINE SLEEVE LOCATIONS.

FILE NAME:
DATE: 3/2/19
SURVEYED BY:
DESIGNED BY: IF
DRAWN BY: IF
REVISED BY: IP
CHECKED BY: IP

TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
IRRIGATION DETAILS

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE: FULL: N.T.S. HALF: N.T.S.

TBPE REG. NO. F-13016

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DATE: 8/15/19

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LANDSCAPE NOTES:

1. CONTRACTOR SHALL BE RESPONSIBLE FOR BECOMING FAMILIAR WITH ALL UNDERGROUND UTILITIES, PIPES AND LINE RUNS. CONTRACTOR SHALL LOCATE AND ESTABLISH ALL EXISTING UTILITIES IN THE CONSTRUCTION AREA BEFORE ANY EXCAVATION SHALL OCCUR.
2. CONTRACTOR SHALL VISIT THE SITE TO EXAMINE THE CONDITIONS, AS THEY EXIST, DETERMINE THE NATURE OF THE MATERIALS TO BE USED AND ALL OTHER PERTINENT INFORMATION TO THE WORK.
3. LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY COORDINATION WITH SUBCONTRACTORS AS REQUIRED TO ACCOMPLISH ALL LANDSCAPE OPERATIONS.
4. BACKFILL MATERIALS FOR ALL TREES AND PALMS SHALL BE 2/3 NEW–COMPOSTED TOPSOIL, AND 1/3 PEAT/HUMUS. PLACE 'AGRIFORM' TABLETS OR APPROVED EQUAL IN ALL BACKFILL MIX.
5. STAKE AND GUY ALL TREES AND PALMS WITH (3) 6" 'T' POST, 12 GAUGE WIRES, AND FLAG GUY WIRES WITH A 12" WHITE FLAGGING TAPE.
6. EDGING TO BE A 2" X 4" 'BEND A BOARD'. ALL BEDS THAT CONTRACT TURF SHALL HAVE EDGING. EDGING TO BE BROWN IN COLOR INSTALLED AS PER MANUFACTURER'S RECOMMENDATION.
7. SOLID SOD TO BERMUDA GRASS, ROLL AND FERTILIZE ALL NEW SOD. CONTRACTOR SHALL SPRAY ALL SOD AREAS WITH 'ROUND UP' IF ANY VEGETATION EXISTS. TILL ALL SOD AREAS TO A DEPTH OF 2". CONTRACTOR SHALL PROPERLY GRADE AND SPREAD TOPSOIL AS REQUIRED. FINISH GRADE PRIOR TO SOD INSTALLATION SHALL BE 1" BELOW TOP OF CURB OR WALKS.
8. CONTRACTOR IS RESPONSIBLE FOR ALL FINE AND FINISHED GRADING. CONTRACTOR SHALL PROVIDE PROPER AND POSITIVE DRAINAGE IN ALL LAWNS AND PLANTING BEDS. COORDINATE ALL SOIL WORK WITH THE SITE CONTRACTOR FOR THE TOPSOIL INSTALLATION AND REQUIREMENTS ASSOCIATED WITH THE SITE WORK.
9. TOP–DRESS ALL BEDS AND TREES WITH 4" OF CYPRESS MULCH. ALL TREES AND BEDS SHALL HAVE DEWITT PRO 5 FABRIC OR APPROVED EQUAL.
10. WARRANTY ON ALL TREES AND SHRUBS SHALL BE FOR ONE YEAR AFTER FINAL ACCEPTANCE.
11. CONTRACTOR SHALL SUBMIT MAINTENANCE INSTRUCTION RECOMMENDING PROCEDURES TO BE ESTABLISHED BY OWNER FOR MAINTENANCE OF LANDSCAPING DURING AN ENTIRE YEAR MAINTENANCE, INCLUDING, BUT NOT LIMITED TO: WEED CONTROL, FERTILIZING, TRIMMING, PRUNING, WATERING, EDGING, AND MOWING. A TYPEWRITTEN MAINTENANCE PROGRAM/SCHEDULE TO BE SUBMITTED TO OWNER AT FINAL ACCEPTANCE.
12. INSTALLER SHALL PROVIDE ALL TOP SOIL THAT IS REQUIRED FOR THE INSTALLATION OF THE LANDSCAPING. THE TOP SOIL SCHEDULE FOR COMPACTED TOP SOIL THICKNESS AT THE FOLLOWING AREAS: LAWN – 4", PLANTING BEDS – 16", INCLUDING 6" OF SUB–BASE AND 6" OF PREPARED MIX AND TOPSOIL.
13. CONTRACTOR SHALL INSTALL A STRIP OF SOLID SOD ALONG ALL HARDSCAPE (CURB, WALK, ETC.) FOR ALL HYDROMULCH AREAS.
14. HYDROMULCHING AREAS: CONTRACTOR SHALL LIGHTLY TILL THE SOIL TO A DEPTH OF 2". GRASS SEED SHALL HAVE THE FOLLOWING MINIMUM RATIO: SUMMER MIX: CYODON DACTYLON (HULLED COMMON BERMUDA GRASS) 85% PURE LIVE SEED AT 75 LBS PURE LIVE SEED PER ACRES. SLURRY MIX COMPONENT PER ACRE SHALL BE WOOD CELLULOSE FIBER MULCH = 2,000 LBS + GRASS SEED AS SPECIFIED + FERTILIZER (13–13–13) 800 LBS. HYDROMULCH SEEDING ON PREPARED FINISH GRADES: A. BED PREPARATION: IMMEDIATELY AFTER THE FINISH GRADE HAS BEEN APPROVED, BEGIN HYDROSEEDING OPERATION TO REDUCE EXCESSIVE WEED GROWTH AND EROSION. B. APPLY SEED FERTILIZER AND MULCH BY SPRAYING THEM ON THE PREVIOUSLY PREPARED SEED BEDS IN THE FORM OF ANY AQUEOUS MIXTURE AND BY USING THE METHODS AND EQUIPMENT DESCRIBED HEREIN. C. PARTICULAR CARE SHALL BE EXERCISED BY THE CONTRACTOR TO INSURE THAT THE APPLICATION IS MADE UNIFORMLY AND AT THE PRESCRIBED RATE AND TO GUARD AGAINST MISSED AND OVERLAPPED AREAS.
15. SEEDED AREA: CONTRACTOR SHALL TILL TO A 2" DEPTH AND SEED WITH BERMUDA AND FERTILIZER. CONTRACTOR IS RESPONSIBLE FOR (3) WATERINGS. NOTIFY OWNER OF WATER DATES FOR APPROVAL.
16. IN ALL PLANTING BEDS THE INSTALLER SHALL REMOVE ALL EXISTING VEGETATION, ROCKS AND CONSTRUCTION DEBRIS, SPRAY ALL BEDS WITH AN APPROVED HERBICIDE TO KILL EXISTING VEGETATION.
17. CONTRACTOR TO PREPARE ALL PLANTING BEDS BY TILLING 4" OF SPECIFIED LANDSCAPE MIX INTO NEW TOPSOIL AND WITH A SLOW RELEASE FERTILIZER TILL TO A DEPTH OF 8".
18. CONTRACTOR TO VERIFY ALL QUANTITIES AND EXISTING CONDITIONS PRIOR TO BID SUBMITTAL.
19. OWNER'S REPRESENTATIVE/ENGINEER WILL INSPECT AND APPROVE ALL BED LAYOUTS, PLANT MATERIAL, BED PREPARATION, SOIL WORK AND PLANT MATERIAL.

IRRIGATION NOTES:

1. CONTRACTOR SHALL CONFORM TO ALL CODES AND ORDINANCE RELEVANT TO THE WORK UNDER THIS CONTRACT.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL LABOR AND MATERIALS NECESSARY TO FULLY EXECUTE AND GUARANTEE THE WORK ENTAILED IN THESE CONTRACT DOCUMENTS.
3. THE AUTOMATIC CONTROL CLOCK IS SCHEMATICALLY INDICATED ON THE PLAN, FINAL LOCATION SHALL BE DETERMINED BY OWNER.
4. CONTRACTOR SHALL ADJUST THE ARC AND RADIUS OF EACH HEAD TO MINIMIZE 'OVERFLOW' AND 'DRY SPOTS'.
5. ALL THE NECESSARY CONNECTIONS AND FITTING 'DOWNSTREAM' OF P.O.C. SHALL BE SUPPLIED AND INSTALLED BY THE CONTRACTOR. VERIFY ACTUAL LOCATION OF P.O.C.
6. IRRIGATION SYSTEM LAYOUT IS DIAGRAMMATIC. EXACT LOCATIONS OF PIPING, SPRINKLER HEADS, VALVES AND OTHER COMPONENTS SHALL BE ESTABLISHED BY CONTRACTOR AND SUBCONTRACTOR IN THE FIELD AT TIME OF INSTALLATION AND APPROVED BY THE ENGINEER.
7. ALL VALVES SHALL BE PLACED IN 10" AND JUMBO VALVE BOXES WITH MINIMUM OF 3" OF GRAVEL FOR DRAINAGE.
8. ACCURATE AS–BUILTS SHOWING AS A MINIMUM VALVE LOCATIONS, WIRE RUNS AND SLEEVE LOCATION WILL BE REQUIRED ALONG WITH PRODUCT INFORMATION AND OPERATIONS MANUALS AT PROJECT CLOSE–OUT.
9. THE ENTIRE IRRIGATION SYSTEM SHALL BE UNCONDITIONALLY GUARANTEED BY THE CONTRACTOR AS TO MATERIAL AND WORKMANSHIP, INCLUDING SETTLING OF BACKFILLED AREAS BELOW GRADE FOR A PERIOD OF ONE (1) YEAR FOLLOWING THE DATE OF FINAL ACCEPTANCE OF WORK. CONTRACTOR AGREES TO REPAIR OR REPLACE ANY SUCH DEFECTS OCCURRING WITHIN THAT YEAR AT HIS EXPENSE.
10. PVB SHALL BE IN A STRONG BOX. ACTUAL LOCATION TO BE APPROVED BY ECISD.
11. CONTRACTOR TO SUPPLY OWNER WITH (10) 1" QUICK COUPLER KEYS, HOSE SWIVEL AND Q.C. SPRINKLERS.
12. CONTRACTOR TO BURY FOUNDATION DRIP 2" BELOW FINISHED GRADE AND 2" AWAY FROM ANY FOUNDATION.

SUBSURFACE IRRIGATION SYSTEM

PRODUCT: TORO DL2000 DRIP (OR APPROVED EQUAL)

FLOW RATE: 1 GPH

EMITTERS SPACING: 12"

ROW SPACING: 2 RINGS FOR TREES, REFER TO IRRIGATION PLAN FOR BEDS

DEPTH: BURIAL DEPTH OF SUB–IRRIGATION SYSTEM TO BE INSTALLED ABOVE LANDSCAPE FABRIC AND UNDER MULCH OR GRANITE.

FILTER: AP4E–100 (OR APPROVED EQUAL)

PRESSURE REGULATOR: PMR25–LF (OR APPROVED EQUAL)

FLUSH CAPS AND AIR VENTS.

INSTALLATION:

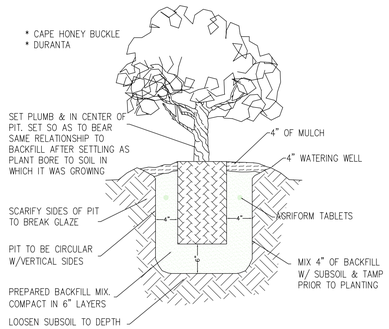
1. THE DRIP LINE SHALL BE INSTALLED AT A UNIFORM DEPTH AND WIDTH. STAPLE ALL DRIPLINES EVERY 5' O.C.
2. PRESSURE TEST THE SYSTEM BEFORE COVERING TRENCHES TO CHECK FOR LEAKS PRIOR TO PLANTING.
3. PRE–IRRIGATE AREAS TO ENSURE THAT THE SOIL IS HYDRATED TO FIELD CAPACITY BEFORE PLANTING SEEDS.
4. PIN ALL DRIPS 5' O.C.

PLANTING:

1. PROVIDE A PROPER SUB GRADE PRIOR TO INSTALLING THE DRIP LINE LATERALS.
2. PLANT ALL LARGE ITEMS PRIOR TO INSTALLING THE DRIPLINE LATERALS AND PLANT THE SMALLER PLANTS AFTER INSTALLING THE DRIPLINE LATERALS.

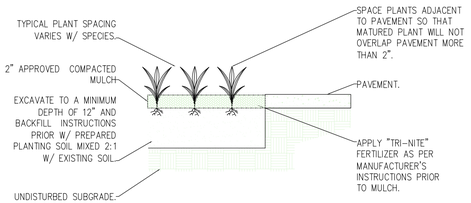
INSTALLATION STEPS:

1. ASSEMBLE AND INSTALL FILTERS, REMOTE CONTROL VALVE AND PRESSURE REGULATING VALVE ASSEMBLY, LINE LATERALS.
2. ASSEMBLE AND INSTALL SUPPLY HEADERS IN ALL FORMAL HEDGE PLANTING.
3. ASSEMBLE AND INSTALL EXHAUST HEADERS. TAPE OR PLUG ALL OPEN ENDS WHILE INSTALLING THE DRIP LINE TO PREVENT DEBRIS CONTAMINATION.
4. INSTALL DRIP LINE LATERALS.
5. INSTALL AIR VACUUM RELIEF VALVES AT THE ZONE HIGHEST POINTS.
6. THOROUGHLY FLUSH SUPPLY HEADERS AND CONNECT DRIP LINE LATERALS WHILE FLUSHING.
7. THOROUGHLY FLUSH DRIP LINE LATERALS AND CONNECT TO EXHAUST HEADERS OR INTER–CONNECTING LATERALS WHILE FLUSHING.
8. THOROUGHLY FLUSH EXHAUST HEADERS AND INSTALL LINE FLUSHING VALVES. FLUSH EACH SEGMENT TO ENSURE THAT NO CONTAMINATION OCCURS.
9. INSTALL AS PER MANUFACTURER'S INSTALLATION INSTRUCTIONS.

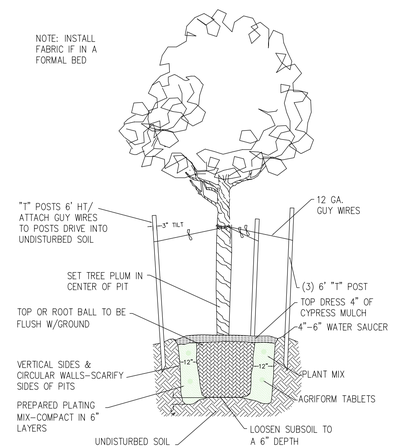


SHRUB PLANTING DETAIL
N.T.S.

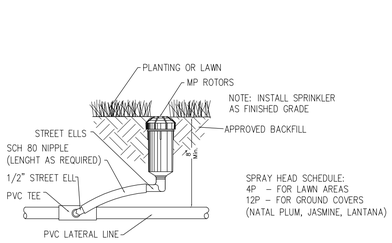
TREE SEPARATION DISTANCE (TYP.)



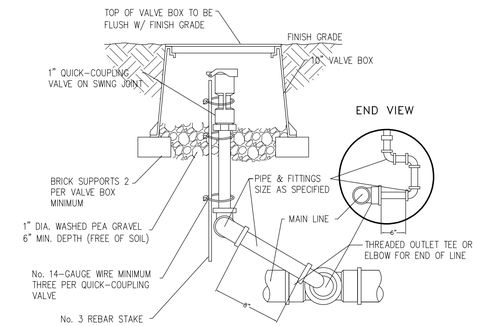
GROUND COVER PLANTING DETAILS
N.T.S.



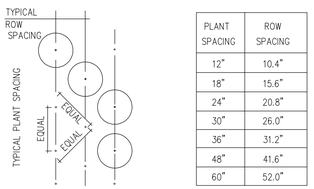
TREE PLANTING AND GUYING DETAIL
N.T.S.



SPRAY HEAD W/SWING JOINT–AP & 12P
N.T.S.

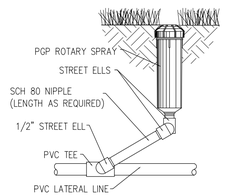


QUICK COUPLING VALVE
N.T.S.

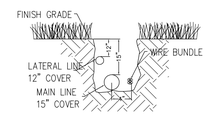


PLANT SPACING	ROW SPACING
12"	10.4"
18"	15.6"
24"	20.8"
30"	26.0"
36"	31.2"
48"	41.6"
60"	52.0"

PLANT: TRIANGULAR SPACING

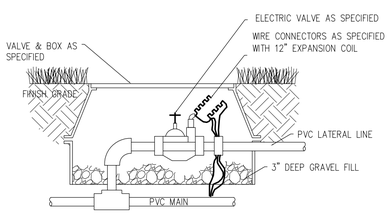


ROTARY SPRAY
N.T.S.

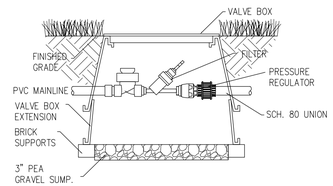


NOTE: PIPE SHALL REST FIRMLY ON TRENCH BOTTOM. BUNDLE WIRE AT 20' INTERVALS. SHAKE PIPE IN TRENCH FROM SIDE TO SIDE. DO NOT STACK PIPES IN THE TRENCH. PROVIDE HORIZONTAL SEPARATION.

PIPE IN TRENCH DETAIL
N.T.S.



TYP. ELECTRIC VALVE
N.T.S.



REMOTE OPERATED VALVE PRESS. REG. AND FILTER FOR SUBSURFACE DRIP
N.T.S.

FILE NAME:
DATE: 3/2/19
SURVEYED BY:
DESIGNED BY: IF
DRAWN BY: IF
REVISED BY: IP
CHECKED BY: IP

TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
LADSCAPING/IRRIGATION DETAILS

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE: FULL: N.T.S. HALF: N.T.S.

TBPE REG. NO. F–13016

STATE OF TEXAS ISAEL POSADAS 89435 LICENSED PROFESSIONAL ENGINEER

RELEASE FOR CONSTRUCTION

ISAEL POSADAS, P.E. No. 89435 ON AUGUST 15, 2019. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION OF THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

DATE: 8/15/19

SHEET NO.: 18 OF 37

Z:\SDI Files\SDI Projects\19–004 EEDC North Park\3 Drawings\Edinburg North Park Sport Complex Sht 1–26.dwg – Aug 15, 2019 – 2:19PM

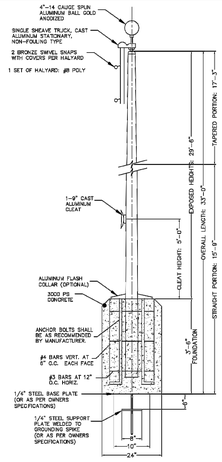
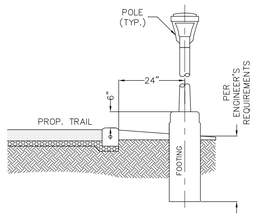
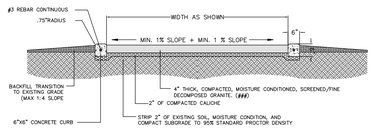


EXHIBIT "A"
(ADDENDUM No. 1-FLAGPOLE FOUNDATION)

FLAG POLE DETAIL

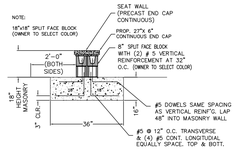


TYPICAL TRAIL LIGHTING

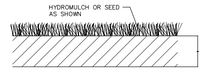


NOTES:
1. CONCRETE CURBING TO HAVE 1 1/2" DEEP CONTRACTION JOINTS @ 5'-0" SPACING.
2. 3000 PSI COMPRESSIVE STRENGTH.
3. SMOOTH TROWELED FINISH AND NATURAL COLOR W/CONCRETE CURING COMPOUND.

DECOMPOSED GRANITE TRAIL DETAIL

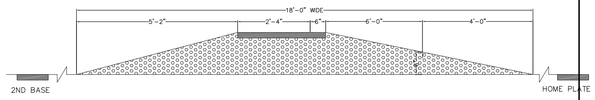


TYPICAL SEAT WALL SECTION

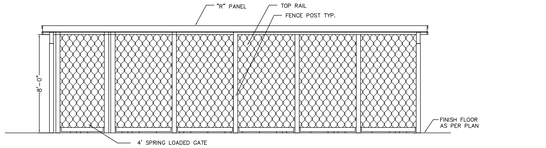


NOTE: ROOT ZONE MATERIAL SHALL BE COMPOSED OF CLEAN MATERIAL FROM ONSITE. COMPACT TO 90% MAX. DENSITY.

TYPICAL TURF SECTION

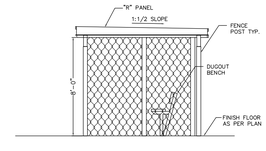


PITCHERS MOUND TYPICAL CROSS-SECTION



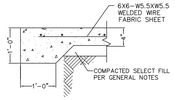
NOTE: CHAINLINK FABRIC SHALL BE 9 GAUGE

DUGOUT FRONT/REAR ELEVATION

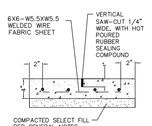


NOTE: CHAINLINK FABRIC SHALL BE 9 GAUGE

DUGOUT SIDE ELEVATION

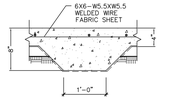


① EXTERIOR SLAB

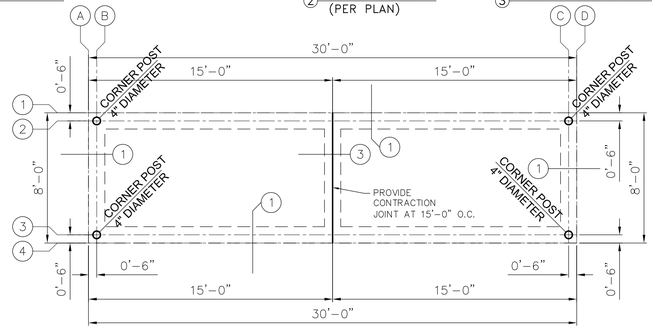


NOTE
1. CONCRETE SHALL HAVE 3000 PSI COMPRESSIVE STRENGTH AT 28 DAYS.
2. COMPACTED SELECT FILL SHALL BE COMPACTED TO 90% STANDARD PROCTOR.

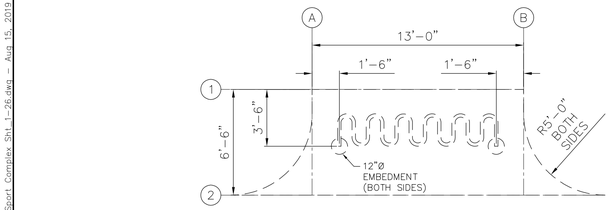
② CONTROL JOINT (PER PLAN)



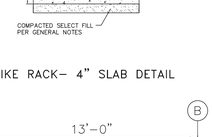
③ INTERIOR THICKENED SLAB



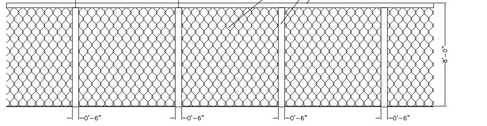
DUGOUT SLAB (HOME/VISITORS)
SCALE: 1/4"=1'-0"



BIKE RACK- 4" SLAB

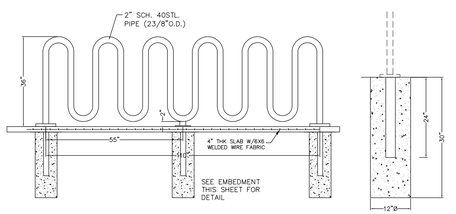


BIKE RACK- 4" SLAB DETAIL



NOTE: CHAINLINK FABRIC SHALL BE 9 GAUGE

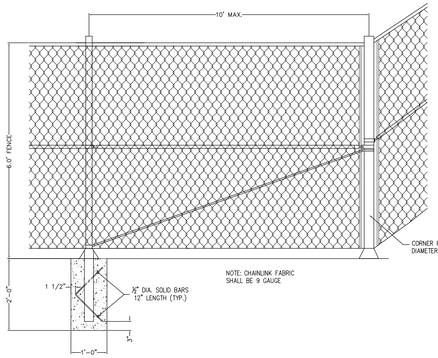
OUTFIELD FENCE ELEVATION (BASEBALL & SOFTBALL) TYP.



BIKE RACK - FRONT VIEW

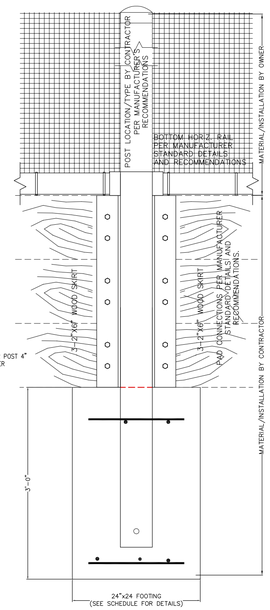
EMBEDMENT

NOTES:
1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURE'S SPECIFICATIONS.
2. DETAIL NOT TO SCALE.
3. 1/2" x 3 3/4" EXPANSION BLOTS PROVIDED FOR OPTION S-2.
4. CONTRACTOR'S NOTE: FOR PRODUCT AND INFORMATION PLEASE REFER TO OWNER'S SPECIFICATIONS.

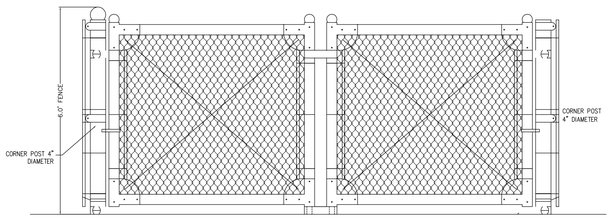


NOTE: CHAINLINK FABRIC SHALL BE 9 GAUGE

ELECTRICAL YARD AND PERIMETER FENCE

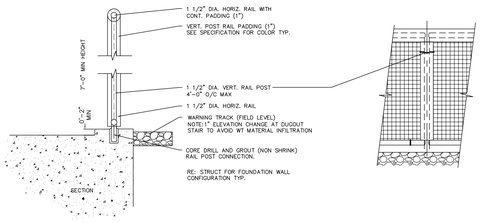


NET WITH BACK STOP



NOTE: CHAINLINK FABRIC SHALL BE 9 GAUGE

ELECTRICAL YARD (DOUBLE DOORS)



RAIL @DUGOUT

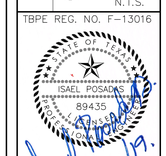
FILE NAME:	
DATE:	3/2/19
SURVEYED BY:	
DESIGNED BY:	IF
DRAWN BY:	IF
REVISED BY:	IP
CHECKED BY:	IP

TITLE:
CITY OF EDINBURG
EDINBURG ECONOMIC DEVELOPMENT CORP
FLAGPOLE, TRAIL & SOFTBALL DETAILS

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE: FULL: N.T.S. HALF: N.T.S.

TBPE REG. NO. F-13016

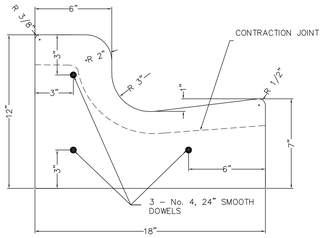


THIS SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY ISAEL POSADAS, P.E. No. 89435 ON AUGUST 15, 2019. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION OF THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

DATE: 8/15/19

SHEET NO.: 19 OF 37

Z:\SDI Files\SDI Projects\19-004 EEDC North Park\3 Drawings\Edinburg North Park Sport Complex Sht 1-26.dwg — Aug 15, 2019 - 2:19PM



GENERAL NOTES:
1. CONCRETE SHALL BE 3000 P.S.I. COMPRESSIVE STRENGTH AT 28 DAY.

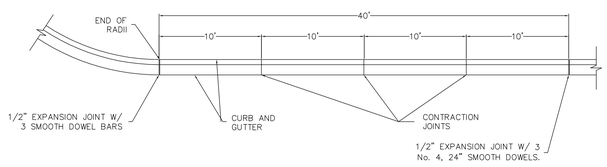
2. ALL CONCRETE WORK SHALL BE TREATED WITH MEMBRANE CURING COMPOUND TYPE 2 WHITE PIGMENTED IN ACCORDANCE w/ TEXAS DEPARTMENT OF TRANSPORTATION DEPARTMENTAL MATERIALS SPECIFICATION ITEM 4650. CONSIDERED INCIDENTAL TO CONCRETE WORK.

3. 1/2" EXPANSION JOINTS REQUIRED AT 40' c.c. AND AT THE BEGINNING AND END OF ALL RADII. CONTRACTION JOINTS SHALL NOT EXCEED 10' c.c.

4. EXPANSION JOINTS SHALL HAVE 1/2 EXPANSION JOINT MATERIAL, AND 3 No. 4, 24" SMOOTH DOWEL BARS COATED TO PREVENT BOND.

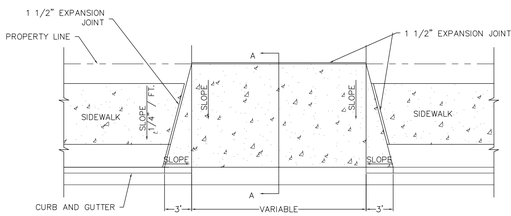
CURB AND GUTTER DETAIL

NOT TO SCALE

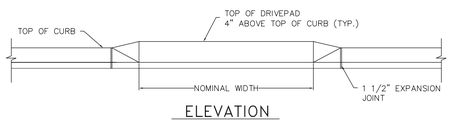


TYPICAL JOINTS

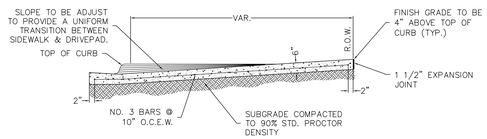
NOT TO SCALE



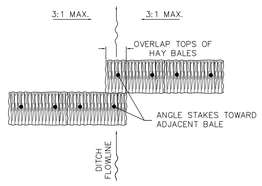
PLAN VIEW



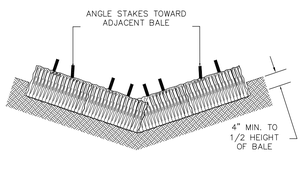
ELEVATION



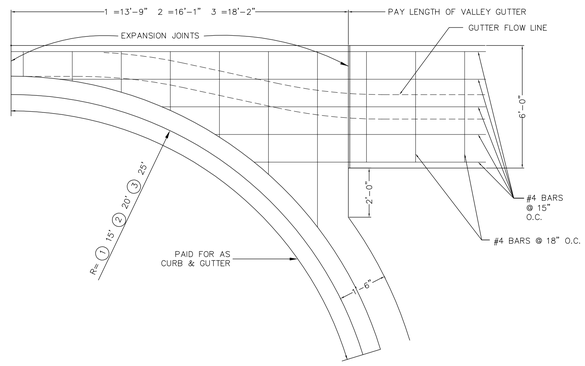
SECTION A–A



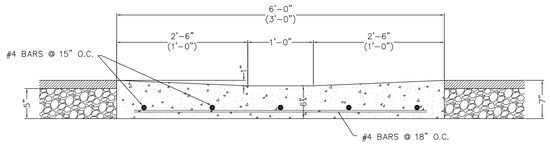
PLAN VIEW



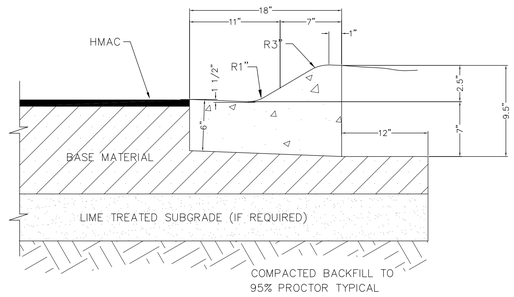
PROFILE VIEW



VALLEY GUTTER DETAIL



TYPICAL VALLEY GUTTER SECTION



TYPICAL LOW PROFILE CURB & GUTTER SECTION

GENERAL NOTES

1. HAY BALES SHALL BE A MINIMUM OF 30" IN LENGTH AND WEIGH A MINIMUM OF 50 LBS.

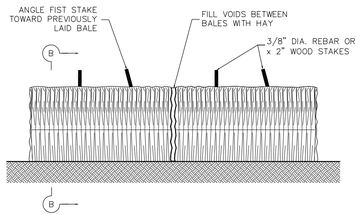
2. HAY BALES SHALL BE BOUND BY EITHER WIRE OR NYLON OR POLYPROPYLENE STRING. THE BALES SHALL BE COMPOSED ENTIRELY OF VEGETABLE MATTER.

3. HAY BALES SHALL BE EMBEDDED IN THE SOIL A MINIUM OF 4" AND WHERE POSSIBLE 1/2 THE HEIGHT OF THE BALE.

4. HAY BALES SHALL BE PLACED IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES. THE BALES SHALL BE PLACED WITH BINDINGS PARALLEL TO THE GROUND.

5. HAY BALES SHALL BE SECURELY ANCHORED IN PLACE WITH 3/8" DIA. REBAR OR 2" X 2" WOOD STAKES, DRIVEN THROUGH THE BALES. THE FIRST STAKE SHALL BE ANGLED TOWARDS THE PREVIOUSLY LAID BALE TO FORCE THE BALES TOGETHER.

6. THE GUIDELINES SHOWN HEREON ARE SUGGESTIONS ONLY AND MAY BE MODIFIED BY THE ENGINEER.



SEDIMENT CONTROL FENCE USAGE GUIDELINES

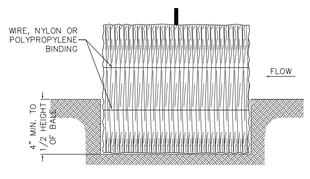
A SEDIMENT CONTROL FENCE MAY BE CONSTRUCTED NEAR THE DOWNSTREAM PERIMETER OF A DISTURBED AREA ALONG A CONTOUR TO INTERCEPT SEDIMENT FROM OVERLAND RUNOFF. A 2 YEAR STORM FREQUENCY MAY BE USED TO CALCULATE THE FLOW RATE TO BE FILTERED.

SEDIMENT CONTROL FENCE SHOULD BE SIZED TO FILTER A MAX. FLOW THROUGH RATE OF 100 GPM/FT². SEDIMENT CONTROL FENCE IS NOT RECOMMENDED TO CONTROL EROSION FROM A DRAINAGE AREA LARGER THAN 2 ACRES.

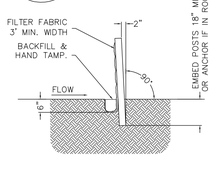
PLAN SHEET LEGEND

SEDIMENT CONTROL FENCE — SCF

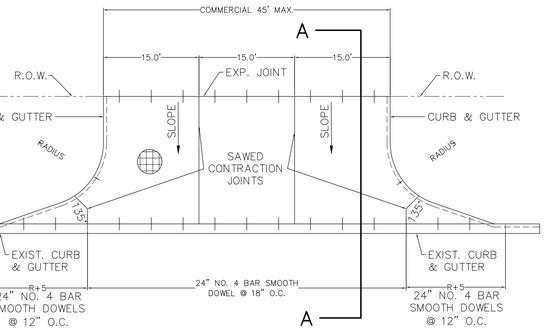
BALED HAY — BH

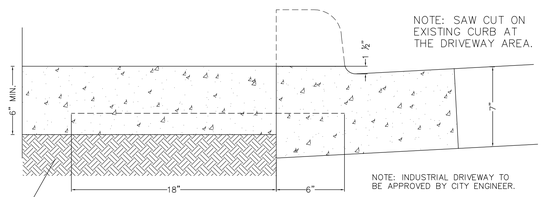


SECTION B–B

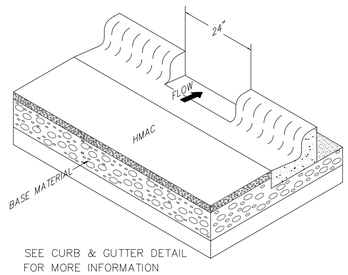


SECTION A–A





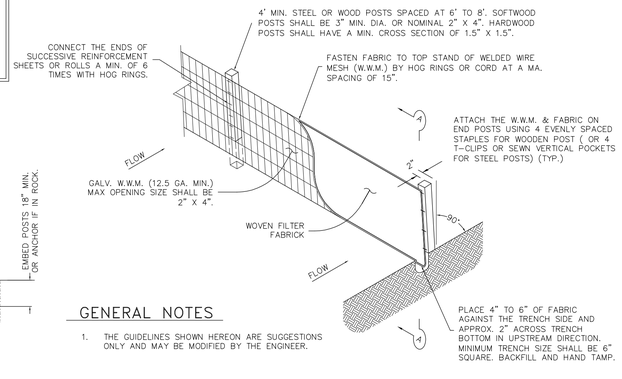
SECTION A–A



SEE CURB & GUTTER DETAIL FOR MORE INFORMATION

TYPICAL CURB SLOT SECTION

CALICHE DETAIL @ PLAYSCAPE



GENERAL NOTES

1. THE GUIDELINES SHOWN HEREON ARE SUGGESTIONS ONLY AND MAY BE MODIFIED BY THE ENGINEER.

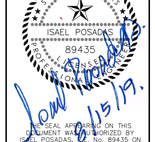
FILE NAME:	
DATE:	3/2/19
SURVEYED BY:	
DESIGNED BY:	IF
DRAWN BY:	IF
REVISED BY:	IP
CHECKED BY:	IP

TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
PARKING LOT DETAILS

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE:	FULL:	N.T.S.
	HALF:	N.T.S.

TBPE REG. NO. F-13016



TECHNICAL APPROVAL ON THIS DOCUMENT AUTHORIZED BY ISAEL POSADAS, P.E. No. 89435 ON AUGUST 15, 2019. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION OF THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

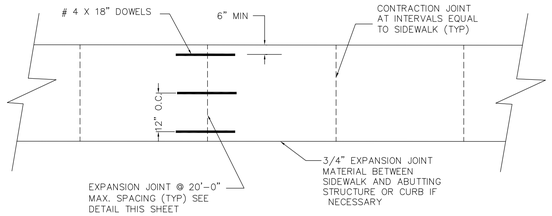
DATE: 8/15/19

SHEET NO.: 20 OF 37

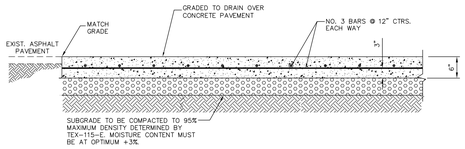
Z:\SDI Files\SDI Projects\19-004 EEDC North Park\3 Drawings\Edinburg North Park Sport Complex Sht 1-26.dwg — Aug 15, 2019 — 2:20PM

SIDEWALK NOTES:

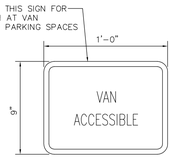
1. MINIMUM 4' –0" WIDE SIDEWALK.
2. SIDEWALK GRADIENT SHALL NOT EXCEED 1: 20.
3. SIDEWALK CONCRETE SHALL BE 5 SACK CEMENT MIX AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI @28 DAYS.
4. CONTRACTOR SHALL VERIFY EXISTENCE AND LOCATION OF EXISTING UTILITY LINES WITH APPROPRIATE COMPANIES TO AVOID PLACING SIDEWALKS ON TOP OF LINES.
5. PROVIDE DROP CURBS AT INTERSECTIONS.
6. CONTRACTOR SHALL COMPLY WITH LATEST REGULATIONS AS SET FORTH IN AMERICANS WITH DISABILITIES ACT (ADA).



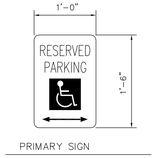
SIDEWALK PLAN



CONCRETE SLAB FOR COMPACTOR & DUMPSTERS



SUPPLEMENTARY SIGN



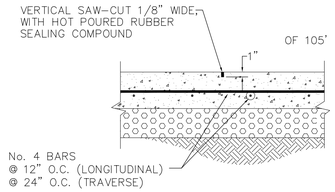
PRIMARY SIGN

GENERAL NOTES

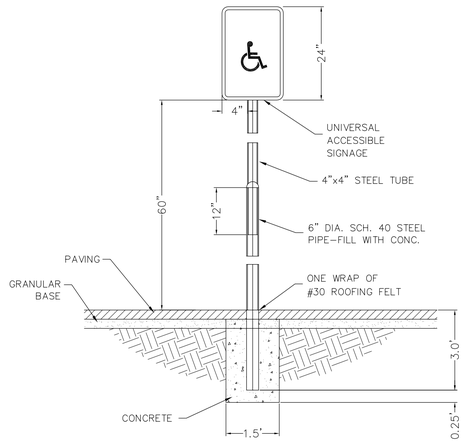
1) ALL SIDEWALKS AND HANDICAPPED RAMPS ARE FOR SCHEMATIC PURPOSES ONLY.

2) THE HANDICAPPED RAMPS MUST BE IN ACCORDANCE WITH THE FEDERAL ADA–AG SUBSECTIONS 4.16, 4.8 AND 429.2 AND THE STATE TAS SUBSECTION 4.3 STANDARDS.

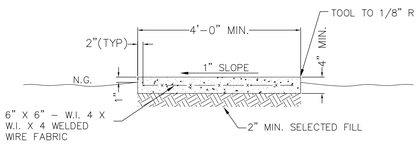
SPACE DUMMY JOINTS USUAL 15' C–C
1/2" PRE MOLDED EXPANSION JOINT MATERIAL TO BE INSTALLED AT EXPANSION JOINT. MAX. SPACING



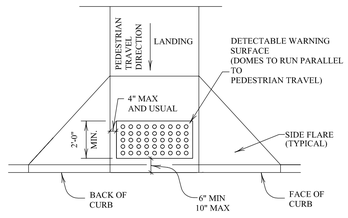
SAWED DUMMY JOINT



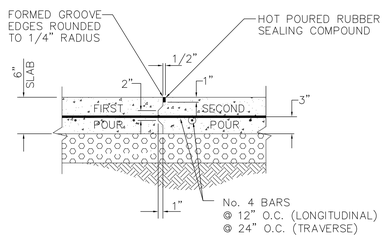
ACCESSIBLE PARKING SIGN



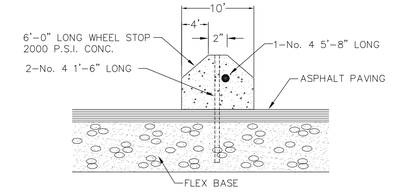
TYPICAL CONC. WALK DETAIL



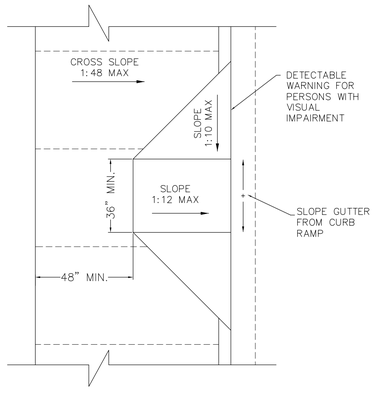
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



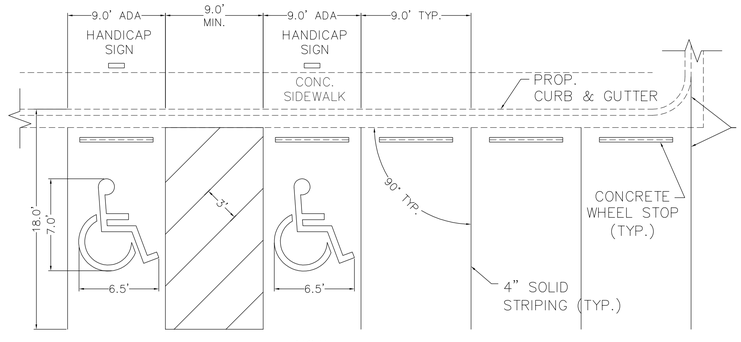
CONSTRUCTION JOINT



CONCRETE WHEEL STOP



RAMP SLOPE DETAIL

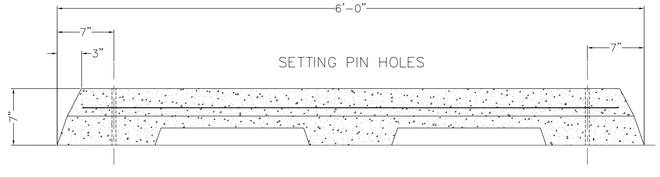


NOTE:
PROPOSED 24.0' BACKUP DISTANCE

NOTE:
FINAL PLACEMENT OF PAVEMENT MARKINGS SHALL BE APPROVED BY THE ENGINEER IN THE FIELD PRIOR TO INSTALLATION.

TYPICAL STRIPING DETAIL FOR ACCESSIBLE AREAS

1. CURB RAMPS MUST CONTAIN A DETECTABLE WARNING SURFACE THAT CONSISTS OF RAISED TRUNCATED DOMES COMPLYING WITH SECTION 4.29 OF THE TEXAS ACCESSIBILITY STANDARDS (TAS). THE SURFACE MUST CONTRAST VISUALLY WITH ADJOINING SURFACES, INCLUDING SIDE FLARES. FURNISH DARK BROWN OR DARK RED DETECTABLE WARNING SURFACE ADJACENT TO UNCOLORED CONCRETE, UNLESS SPECIFIED ELSEWHERE IN THE PLANS.
2. DETECTABLE WARNING SURFACES MUST BE SLIP RESISTANT AND NOT ALLOW WATER TO ACCUMULATE.
3. ALIGN TRUNCATED DOMES IN THE DIRECTION OF PEDESTRIAN TRAVEL WHEN ENTERING THE STREET.
4. SHADED AREAS ON DETAILS INDICATE THE APPROXIMATE LOCATION FOR THE DETECTABLE WARNING SURFACE FOR EACH CURB RAMP TYPE.
5. DETECTABLE WARNING SURFACES SHALL BE A MINIMUM OF 24" IN DEPTH IN THE DIRECTION OF PEDESTRIAN TRAVEL, AND EXTEND THE FULL WIDTH OF THE CURB RAMP OR LANDING WHERE THE PEDESTRIAN ACCESS ROUTE ENTERS THE STREET.
6. DETECTABLE WARNING SURFACES SHALL BE LOCATED SO THAT THE EDGE NEAREST THE CURB LINE IS A MINIMUM OF 6" AND A MAXIMUM OF 10" FROM THE EXTENSION OF THE FACE OF CURB. DETECTABLE WARNING SURFACES MAY BE CURVED ALONG THE CORNER RADIUS.
7. TXDOT MAINTAINS A LIST OF QUALIFIED DETECTABLE WARNING MATERIALS. REFER TO FEDERAL AND STATE DOT CURB RAMP WITH DETECTABLE WARNING STANDARDS, REFER TO THE MANUFACTURER'S PRODUCT MANUAL FOR PROPER INSTALLATION.



CONCRETE WHEEL STOP

FILE NAME:	
DATE:	3/2/19
SURVEYED BY:	
DESIGNED BY:	IF
DRAWN BY:	IF
REVISED BY:	IP
CHECKED BY:	IP

TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
PARKING LOT DETAILS

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE:	
FULL:	N.T.S.
HALF:	N.T.S.

TBPE REG. NO. F-13016

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY ISAEL POSADAS, P.E. No. 89435 ON AUGUST 15, 2019. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION OF THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

DATE: 8/15/19

SHEET NO.: 21 OF 37

RIPRAP TOE LENGTHS

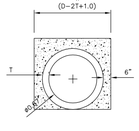
SLOPE	"R"	"T"
3 : 1	2'-9"	1'-9"
4 : 1	3'-8"	2'-4"
5 : 1	4'-7"	2'-11"
6 : 1	5'-6"	3'-6"

SAFETY END TREATMENT PIPE LENGTHS

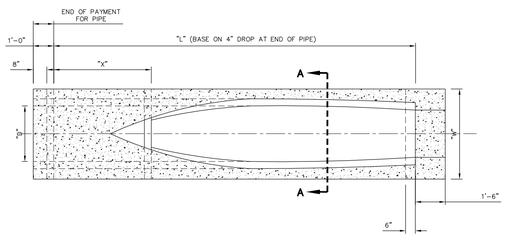
PIPE DIA. (IN.)	L			
	3 : 1	4 : 1	5 : 1	6 : 1
12"	2'-0"	2'-8"	3'-4"	4'-0"
15"	2'-9"	3'-6"	4'-7"	5'-6"
18"	3'-6"	4'-8"	5'-10"	7'-0"
24"	5'-1 1/2"	6'-10"	8'-6 1/2"	10'-3"
30"	6'-9"	9'-0"	11'-3"	13'-6"
36"	8'-6"	11'-4"	14'-2"	17'-0"
42"	10'-1 1/2"	13'-6"	16'-10 1/2"	20'-3"
48"	11'-9"	15'-8"	19'-7"	23'-6"

ESTIMATED RIPRAP CL "A" VOLUME (CY)

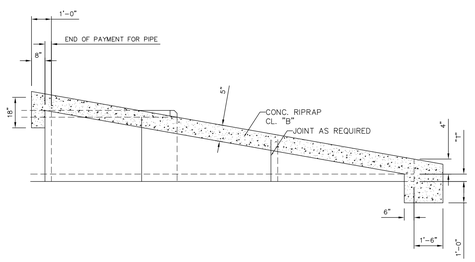
PIPE DIA. (IN.)				
	3 : 1	4 : 1	5 : 1	6 : 1
12"	.88	1.11	1.34	1.57
15"	.98	1.23	1.49	1.75
18"	1.08	1.36	1.64	1.93
24"	1.29	1.63	1.97	2.32
30"	1.50	1.91	2.32	2.73
36"	1.73	2.21	2.69	3.17
42"	1.95	2.50	3.05	3.60
48"	2.18	2.80	3.42	4.05



A–A

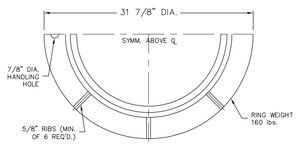


PLAN

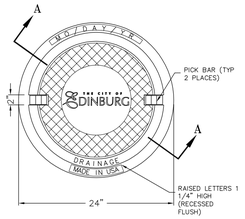


ELEVATION

SLOPED REINFORCED CONCRETE PIPE

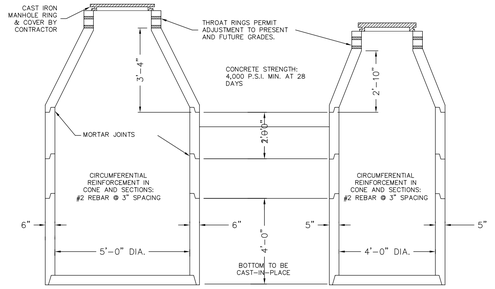


RING SECTION



COVER TOP VIEW

CITY STANDARD ROADWAY MANHOLE RING & COVER CASTING DETAIL



WEIGHTS OF 5'-0" DIA. MANHOLE

THROAT RING	90 LBS.
CONE SECTION	2800 LBS.
1'-0" SECTION	1329 LBS.
2'-0" SECTION	2658 LBS.
3'-0" SECTION	3987 LBS.
4'-0" SECTION	5316 LBS.

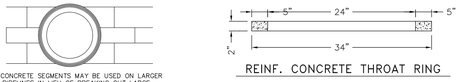
MANHOLES SECTIONS ARE CAST IN

1'-0" LENGTHS
2'-0" LENGTHS
3'-0" LENGTHS
4'-0" LENGTHS

WEIGHTS OF 4'-0" DIA. MANHOLE

THROAT RING	90 LBS.
CONE SECTION	1750 LBS.
1'-0" SECTION	875 LBS.
2'-0" SECTION	1750 LBS.
3'-0" SECTION	2625 LBS.
4'-0" SECTION	3500 LBS.

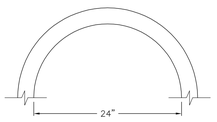
PRECAST CONCRETE SEGMENTS MAY BE USED ON LARGER DIAMETER PIPELINES IN LIEU OF BREAKING OUT LARGE HOLES IN PRECAST SECTIONS.



REINF. CONCRETE THROAT RING

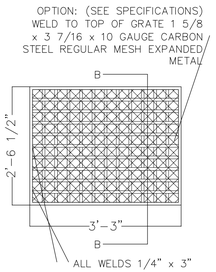
SEGMENTAL BLOCK

5'-0" DIA. – 15 BLOCKS FULL CIRCLE 4'-0" DIA. – 12 BLOCKS FULL CIRCLE



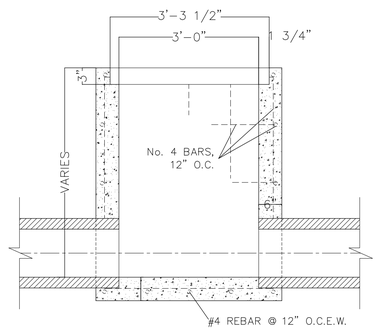
PRECAST CONCRETE MANHOLES – DETAILS

TOP VIEW OF INLET

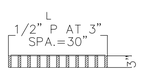


TOP VIEW OF GRATE

(BYCYCLE PROOF)



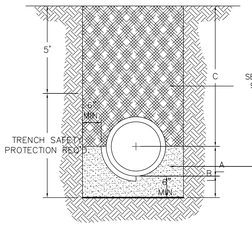
SECTION "A–A"



SECTION "B–B"

TYPE "C" GRATED INLET

NOTE: WHEN UTILITY LOCATED WITHIN CITY R.O.W., ALL BACKFILL IS SUBJECT TO INSPECTION, TESTING AND APPROVAL BY THE CITY ENGINEER'S OFFICE



STANDARD PIPE BEDDING

A. GRAVEL (3/4" MAX. SIZE) BEDDING PLACED BEFORE PIPE IS LAID UP TO FLOW LINE OF PIPE. (MIN. THICKNESS = 6")

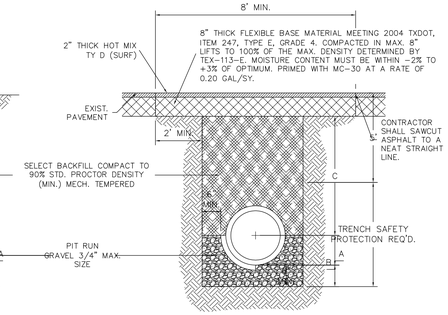
B. GRAVEL BACK FILL PLACED AFTER PIPE IS LAID FROM BOTTOM OF PIPE TO SPRING LINE OF PIPE. (4" LIFTS, MECH. TAMPED).

C. FILL TRENCH W/SELECT BACKFILL (PI<20), W/12" LIFTS COMPACT TO 95% STD. PROCTOR

FOUNDATION PREPARATION (WELLPOINTS, GRAVEL AND/OR CEMENT STABILIZATION, OR APPROVED SUBSTITUTE) SHALL BE REQUIRED WHEN TRENCH BOTTOM IS UNSTABLE.

BACK FILLING AT STRUCTURES SHALL BE PLACED IN UNIFORM LAYERS, MOISTENED AS REQUIRED TO APPROXIMATE OPTIMUM MOISTURE CONTENTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY. THE THICKNESS OF EACH LOOSE LAYER SHALL BE SAND, APPROVED SITE SOIL OR OTHER APPROVED SUBSTITUTE.

NOTE: ALL EXISTING STREET CROSSINGS SHALL REQUIRE SAND BACKFILL OF ENTIRE TRENCH.



STANDARD PIPE BEDDING

UNDER EXISTING PAVEMENT OR PROP. PAVEMENT

A. GRAVEL (3/4" MAX. SIZE) BEDDING PLACED BEFORE PIPE IS LAID UP TO FLOW LINE OF PIPE. (MIN. THICKNESS = 6")

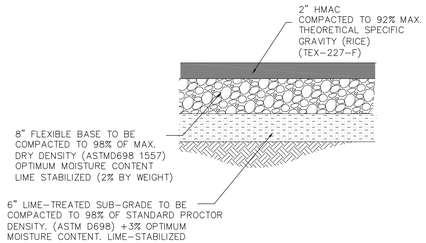
B. GRAVEL BACK FILL PLACED AFTER PIPE IS LAID FROM BOTTOM OF PIPE TO SPRING LINE OF PIPE. (4" LIFTS, MECH. TAMPED).

C. FILL TRENCH W/SELECT BACKFILL (PI<20), W/12" LIFTS COMPACT TO 95% STD. PROCTOR

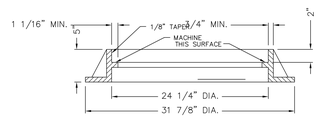
FOUNDATION PREPARATION (WELLPOINTS, GRAVEL AND/OR CEMENT STABILIZATION, OR APPROVED SUBSTITUTE) SHALL BE REQUIRED WHEN TRENCH BOTTOM IS UNSTABLE.

BACK FILLING AT STRUCTURES SHALL BE PLACED IN UNIFORM LAYERS, MOISTENED AS REQUIRED TO APPROXIMATE OPTIMUM MOISTURE CONTENTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY. THE THICKNESS OF EACH LOOSE LAYER SHALL BE SAND, APPROVED SITE SOIL OR OTHER APPROVED SUBSTITUTE.

STANDARD PIPE BEDDING – DETAILS



TYPICAL 2" ASPHALT PAVEMENT SECTION (EXHIBIT "A")



SECTION A – A

NOTE:
ALL MANHOLE COVERS & RINGS TO BE DOMESTIC EAST JORDAN IRON WORKS MODEL# V-1342 OR APPROVED EQUAL (ASTM A48-CL35) 894785984

FILE NAME:
DATE: 3/2/19
SURVEYED BY:
DESIGNED BY: IF
DRAWN BY: IF
REVISED BY: IP
CHECKED BY: IP

TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
DRAINAGE DETAILS

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE: FULL: N.T.S. HALF: N.T.S.

TBPE REG. NO. F-13016

ISAEL POSADAS 89435 LICENSED PROFESSIONAL ENGINEER STATE OF TEXAS

8/15/19

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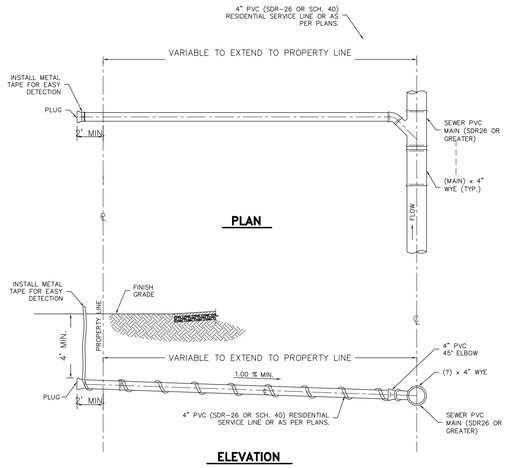
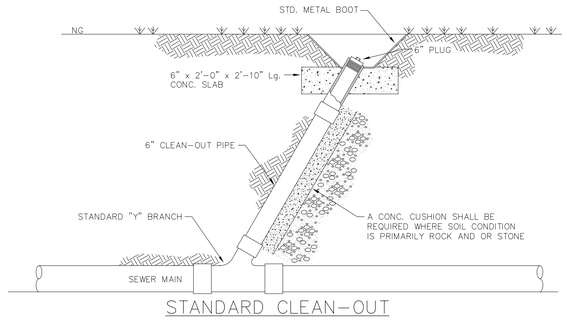
DATE: 8/15/19

SHEET NO.: 22 OF 37

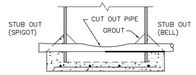
Z:\SDI Files\SDI Projects\19-004 EEDC North Park\3 Drawings\Edinburg North Park Sport Complex Sht 1-26.dwg – Aug 15, 2019 – 2:56PM



TYPICAL RESIDENTIAL SEWER SERVICE DETAIL

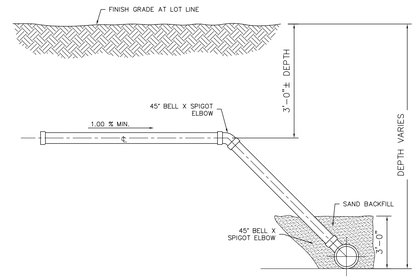


STANDARD CLEAN-OUT



SECT. VIEW A-A

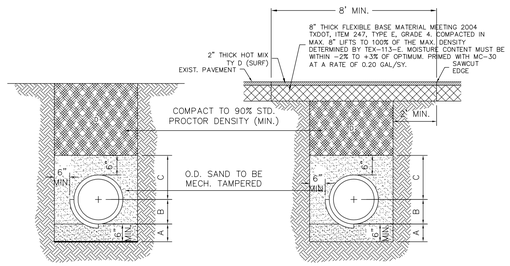
1. CUT PIPE TO LENGTH 7' FOR 4' M.H.
2. LAY PIPE
3. EXCAVATE UNDER PIPE FOR M.H. BASE MIN. 6"
4. PLACE REBAR MAT
5. PLACE CONCRETE
6. IMMEDIATELY PLACE FIBERGLASS M.H.
7. GROUT INSIDE WALLS OF M.H. AROUND PIPE
8. CUT OUT PIPE
9. NO PRE-CAST BASES PERMITTED.



TYPICAL DEEP SERVICE CONNECTION

NOTE: WHEN UTILITY LOCATED WITHIN CITY R.O.W., ALL BACK FILL IS SUBJECT TO INSPECTION AND APPROVAL BY THE CITY ENGINEER'S OFFICE

NOTE: WHEN UTILITY LOCATED WITHIN CITY R.O.W., ALL BACKFILL IS SUBJECT TO INSPECTION AND APPROVAL BY THE CITY ENGINEER'S OFFICE



STANDARD PIPE BEDDING (MAIN & SERVICE LATERALS)

APPLICABLE BENEATH FUTURE/UNPAVED STREETS

A. SAND BEDDING PLACED BEFORE PIPE IS LAID UP TO FLOW LINE OF PIPE. (MIN. THICKNESS = 6")

B. SAND BACK FILL PLACED AFTER PIPE IS LAID FROM BOTTOM OF PIPE TO SPRING LINE OF PIPE. (4" LIFTS, MECH. TAMPED).

C. SAND BACK FILL PLACED FROM SPRING LINE OF PIPE TO 6" ABOVE TOP OF PIPE. (6" LIFTS, MECH. TAMPED).

D. FILL TRENCH W/SELECT BACKFILL, W/12" LIFTS COMPACT TO 90% STD. PROCTOR.

FOUNDATION PREPARATION (WELL POINTS, GRAVEL OR CEMENT STABILIZATION, OR APPROVED SUBSTITUTE) SHALL BE REQUIRED WHEN TRENCH BOTTOM IS UNSTABLE.

BACK FILLING AT STRUCTURES SHALL BE PLACED IN UNIFORM LAYERS, MOISTENED AS REQUIRED TO APPROXIMATE OPTIMUM MOISTURE CONTENTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY. THE THICKNESS OF EACH LOOSE LAYER SHALL BE SAND, APPROVED SITE SOIL OR OTHER APPROVED SUBSTITUTE.

STANDARD PIPE BEDDING (MAIN ONLY)

(PARALLEL WITHIN EXIST. STREET)

A. SAND BEDDING PLACED BEFORE PIPE IS LAID UP TO FLOW LINE OF PIPE. (MIN. THICKNESS = 6")

B. SAND BACK FILL PLACED AFTER PIPE IS LAID FROM BOTTOM OF PIPE TO SPRING LINE OF PIPE. (4" LIFTS, MECH. TAMPED).

C. SAND BACK FILL PLACED FROM SPRING LINE OF PIPE TO 6" ABOVE TOP OF PIPE. (6" LIFTS, MECH. TAMPED).

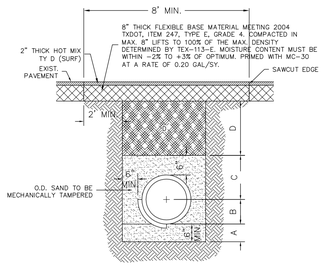
D. FILL TRENCH W/SELECT BACKFILL, W/12" LIFTS COMPACT TO 90% STD. PROCTOR.

FOUNDATION PREPARATION (WELL POINTS, GRAVEL OR CEMENT STABILIZATION, OR APPROVED SUBSTITUTE) SHALL BE REQUIRED WHEN TRENCH BOTTOM IS UNSTABLE.

BACK FILLING AT STRUCTURES SHALL BE PLACED IN UNIFORM LAYERS, MOISTENED AS REQUIRED TO APPROXIMATE OPTIMUM MOISTURE CONTENTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY. THE THICKNESS OF EACH LOOSE LAYER SHALL BE SAND, APPROVED SITE SOIL OR OTHER APPROVED SUBSTITUTE.

NOTE: ALL EXISTING/ACTIVE STREET CROSSINGS SHALL REQUIRE SAND BACKFILL OF ENTIRE TRENCH. (SEE DETAIL S-6)

SEWER STANDARD PIPE BEDDING



STANDARD PIPE BEDDING (MAIN & SERVICE LATERALS)

UNDER EXISTING/ACTIVE STREET CROSSINGS.

A. SAND BEDDING PLACED BEFORE PIPE IS LAID UP TO FLOW LINE OF PIPE. (MIN. THICKNESS = 6")

B. SAND BACK FILL PLACED AFTER PIPE IS LAID FROM BOTTOM OF PIPE TO SPRING LINE OF PIPE. (4" LIFTS, MECH. TAMPED).

C. SAND BACK FILL PLACED FROM SPRING LINE OF PIPE TO 6" ABOVE TOP OF PIPE. (6" LIFTS, MECH. TAMPED).

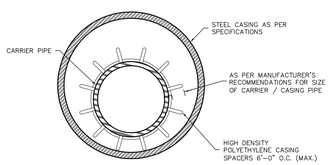
D. FILL TRENCH W/SAND (12" LIFTS, MECH. TAMPED).

FOUNDATION PREPARATION (WELLPOINTS, GRAVEL OR CEMENT STABILIZATION, OR APPROVED SUBSTITUTE) SHALL BE REQUIRED WHEN TRENCH BOTTOM IS UNSTABLE.

BACK FILLING AT STRUCTURES SHALL BE PLACED IN UNIFORM LAYERS, MOISTENED AS REQUIRED TO APPROXIMATE OPTIMUM MOISTURE CONTENTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY. THE THICKNESS OF EACH LOOSE LAYER SHALL BE SAND, APPROVED SITE SOIL OR OTHER APPROVED SUBSTITUTE.

UTILITY CROSSING AT EXIST./ACTIVE STREET DETAIL (WATER/SEWER)

BORING INSTALLATION		
CARRIER PIPE SIZE	PIPE CASING SIZE	MIN. WALL THICKNESS
6"	14"	0.187"
8"	16"	0.187"
10"	18"	0.250"
12"	20"	0.250"
14", 15"	24"	0.344"
16"	24"	0.344"
18"	30"	0.375"
24"	36"	0.375"
36"	48"	0.625"



GENERAL NOTES:

1. ALL STEEL CASING SHALL BE WELDED.

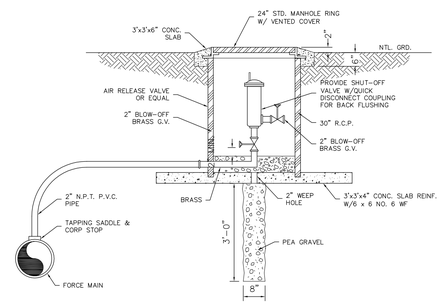
2. STEEL CASING SHALL BE CLOSED AT EACH END USING BRICK OR BLOCK AND MORTAR GROUTED.

3. CASING SPACERS SHALL BE USED TO INSTALL THE CARRIER PIPE INSIDE THE ENCASEMENT PIPE. CASING SPACERS SHALL FASTEN TIGHTLY ONTO THE CARRIER PIPE SO THAT WHEN THE CARRIER PIPE IS BEING INSTALLED THE SPACERS WILL NOT MOVE ALONG THE PIPELINE. CASING SPACERS SHALL BE DOUBLED ON EACH END OF THE ENCASEMENT.

4. PROJECTION – TYPE CASING SPACERS SHALL BE CONSTRUCTED OF PREFORMED SECTIONS OF HIGH DENSITY POLYETHYLENE. THE FLEXIBLE SECTIONS SHALL BE JOINED TOGETHER AROUND THE PIPE TO PROVIDE A MINIMUM OF 16 PLASTIC PROJECTIONS PER SPACER SECTION.

5. INSTALLATION AND SIZE OF SPACERS SHALL BE AS PER MANUFACTURER'S RECOMMENDATIONS.

UTILITY LINE BORE



INSTALLATION DETAIL SEWAGE AIR RELEASE VALVE

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

FILE NAME:	
DATE:	3/2/19
SURVEYED BY:	
DESIGNED BY:	IF
DRAWN BY:	IF
REVISED BY:	IP
CHECKED BY:	IP

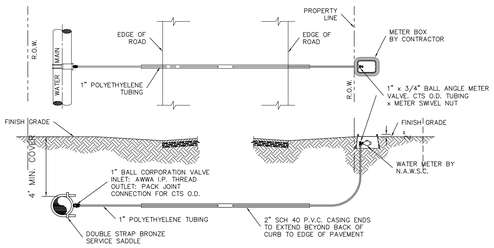
TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
SANITARY SEWER DETAILS

SCALE: FULL: N.T.S. HALF: N.T.S.

TBPE REG. NO. F-13016

DATE: 8/15/19

SHEET NO.: 23 OF 37



TYPICAL SINGLE WATER SERVICE CONNECTION

OPTION 2 (FAR SIDE)

NOTES:
1 – METER AND METER BOX TO BE PROVIDED BY CONTRACTOR.

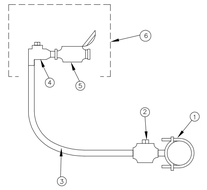
2 – FOR FOUR COMMERCIAL BUILDING USE 4" BALL CORP. VALVES, 4" TYPE "K" COPPER AND 8" PVC CASING.

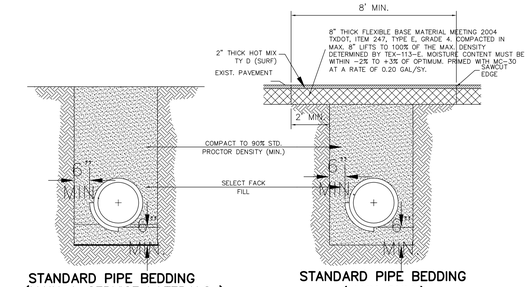
3 – 4" MIN. COVER FOR WATER MAINS 5' MIN. FOR ALL ARTERIAL OR GREATER CLASSIFICATIONS.

4 – COMMERCIAL INSTALLATIONS TO BE 2" SINGLE SERVICE UNLESS OTHERWISE APPROVED BY ENGINEER.

2" METER SERVICE

1.) X" x 2" DOUBLE STRAP BRASS SADDLE
2.) 2" BALL CORP. MPX C.T.S.
3.) 2" COPPER TUBING TYPE "K" (OPTION 1) OR 2" RIGID PIPE TYPE "K" (OPTION 1) OR POLYETHYELENE TUBING (OPTION 2)
4.) 2" BRASS ANGLE STOP
5.) WATER METER BY N.A.W.S.C.
6.) LAGE C.I. METER BOX





STANDARD PIPE BEDDING (MAIN & SERVICE LATERALS)

APPLICABLE BENEATH FUTURE/UNPAVED STREETS

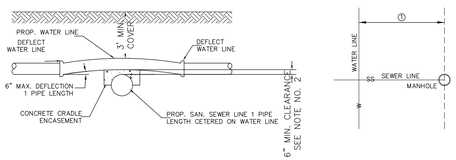
BACK FILLING AT STRUCTURES SHALL BE PLACED IN UNIFORM LAYERS, MOISTENED AS REQUIRED TO APPROXIMATE OPTIMUM MOISTURE CONTENTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.

STANDARD PIPE BEDDING (MAIN ONLY)

(PARALLEL WITHIN EXIST. STREET)

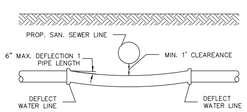
BACK FILLING AT STRUCTURES SHALL BE PLACED IN UNIFORM LAYERS, MOISTENED AS REQUIRED TO APPROXIMATE OPTIMUM MOISTURE CONTENTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.

NOTES AS PER TEXAS DEPT. OF HEALTH MANUAL
A. WATER LINE\NEW SEWER LINE SEPARATION.
WHEN NEW SANITARY SEWERS ARE INSTALLED, THEY SHALL BE INSTALLED NO CLOSER TO WATERLINE THAN NINE FEET IN ALL DIRECTIONS. SEWERS THAT PARALLEL WATERLINES MUST INSTALLED IN SEPARATE TRENCHES, WHERE THE NINE FOOT SEPARATION DISTANCE CANNOT BE ACHIEVED, THE FOLLOWING GUIDELINES WILL APPLY:
(1) WHERE A SANITARY SEWER PARALLELS A WATERLINES, THE SEWER SHALL BE CONSTRUCTED OF CAST IRON, DUCTILE IRON OR PVC MEETING ASTM SPECIFICATIONS WITH A PRESSURE RATING FOR BOTH THE PIPE AND JOINTS OF 150 PSI. THE VERTICAL SEPARATION SHALL BE A MINIMUM OF TWO FEET BETWEEN OUTSIDE DIAMETERS AND HORIZONTAL SEPARATION SHALL BE A MINIMUM OF FOUR FEET BETWEEN OUTSIDE DIAMETER. THE SEWER SHALL BE LOCATED BELOW THE WATERLINE.
(2) WHERE A SANITARY SEWER CROSSES A WATERLINE AND THE SEWER IS CONSTRUCTED OF CAST IRON, DUCTILE IRON OF PVC WITH A MINIMUM PRESSURE RATING OF 150 PSI, AN ABSOLUTE MINIMUM DISTANCE OF 6 INCHES BETWEEN OUTSIDE DIAMETER SHALL BE MAINTAINED, IN ADDITION THE SEWER SHALL BE LOCATED BELOW THE WATERLINE WHERE POSSIBLE AND ONE LENGTH OF THE SEWER PIPE MUST BE CENTERED ON THE WATERLINE.
(3) WHERE A SEWER CROSSES UNDER A WATERLINE AND THE SEWER IS CONSTRUCTED OF ABS TRUSS PIPE, SIMILAR SEMI-RIGID PLASTIC COMPOSITE PIPE, CLAY PIPE OR CONCRETE PIE WITH GASKETS JOINTS, A MINIMUM TWO FEET SEPARATION DISTANCE SHALL BE MAINTAINED. THE INITIAL BACKFILL SHALL BE CEMENT STABILIZED SAND (TWO OR MORE BAGS OF CEMENT PER CUBIC YARD OF SAND) THE INITIAL BACKFIELD SHALL BE CEMENT STABILIZED SAND (TWO OF MORE BAGS OF CEMENT. FOR ALL SECTIONS OF SEWER WITHIN NINE FEET OF WATERLINE, THE INITIAL BACK FILL SHALL BE FROM ONE QUARTER DIAMETER BELOW THE CENTERLINE OF THE PIPE TO ONE PIPE DIAMETER (BUT NOT LESS THAN 12 INCHES) ABOVE TOP OF PIPE.
(4) WHERE A SEWER CROSSES OVER A WATERLINE ALL PORTIONS OF THE SEWER WITHIN NINE FEET OF THE WATERLINE SHALL BE CONSTRUCTED OF CAST IRON, DUCTILE IRON, OR PVC PIPE WITH A PRESSURE RATING OF A LEAST 150 PSI USING APPROPRIATE ADAPTERS, IN LIEU OF THIS PROCEDURE THE NEW CONVEYANCE MAY BE ENCASED IN A JOINT OF 150 PSI PRESSURE CLASS PIPE AT LEAST 18 FEET LONG AND TWO NOMINAL SIZES LARGER THAN THE NEW CONVEYANCE. THE SPACE AROUND THE CARRIER PIPE SHALL BE SUPPORTED AT 5 FEET INTERVALS WITH SPACERS OF BE FILLED TO THE SPRINGLINE WITH WASHED SAND, THE ENCASEMENT PIPE SHOULD BE CENTERED ON THE CROSSING AND BOTH ENDS SEALED WITH CEMENT GROUT OR MANUFACTURED SEAL.
B. WATER LINE\MANHOLE SEPARATION.
UNLESS SANITARY SEWER MANHOLES AND THE CONNECTING SEWER CAN BE MADE WATERTIGHT AND TESTED FOR LEAKAGE, THEY MUST BE INSTALLED SO AS TO PROVIDE A MINIMUM OF NINE FEET OF HORIZONTAL CLEARANCE FROM AN EXISTING OR PROPOSED WATERLINE, WHERE THE NINE FOOT SEPARATION DISTANCE CANNOT BE ACHIEVED, A CARRIER PIPE AS DESCRIBED IN SUBSECTION A. (4) OF THIS SECTION MAY BE WHERE APPROPRIATE. SUBSECTION A. (4) OF THIS SECTIONS MAY BE USED WHERE APPROPRIATE.

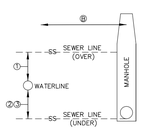


WATERLINE CROSSING OVER SEWER LINE

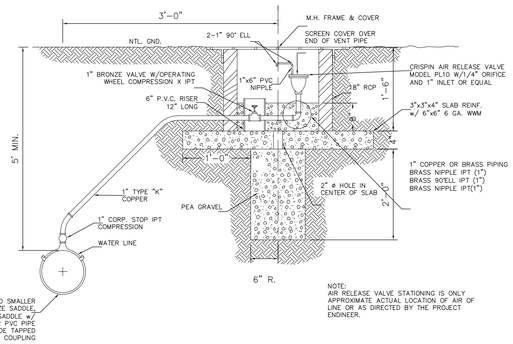
PLAN



WATERLINE CROSSING UNDER SEWER LINE

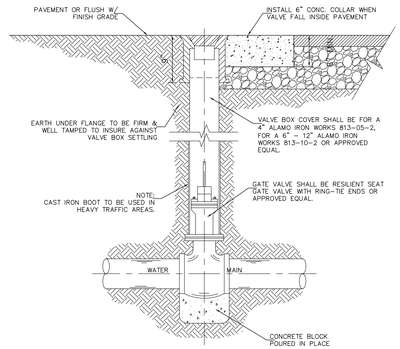


PROFILE



NOTE:
AIR RELEASE VALVE STATIONING IS ONLY APPROXIMATE ACTUAL LOCATION OF AIR OF LINE OR AS DIRECTED BY THE PROJECT ENDINEER.

TYPICAL AIR RELEASE VALVE INSTALLATION DETAIL



TYPICAL VALVE AND VALVE BOX INSTALLATION ON MAIN LINE

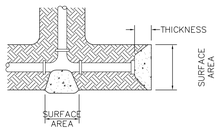
MUELLER (A-2360 SERIES) OR AMERICAN FLOW CONTROL (AFC-2500) ONLY
NOTE: ALL FITTINGS TO BE GREASED AND WRAPPED IN PLASTIC.

THRUST BLOCK SIZE			
	HORIZONTAL BENDS		
DIAMETER OF PIPE IN INCHES	SURFACE AREA SQ. FT.	THICKNESS IN INCHES	WEIGHT AT VERTICAL BENDS-LBS.
22-1/2° BENDS			
6 OR LESS	2	8	1,700
8	3	12	3,000
10	3.5	12	4,500
12	4	14	6,600
14	5	18	9,000
16	6	18	11,800
45° BEND			
6 OR LESS	4	12	3,200
8	5	14	5,800
10	6	18	9,000
12	7	18	13,000
14	8	24	17,000
16	11.5	24	23,200
90° BEND			
6 OR LESS	6	12	6,000
8	8	15	10,700
10	10	18	16,700
12	12	18	24,000
14	18	24	32,600
16	21	24	42,700
TEES & DEAD ENDS			
6 OR LESS	3	12	--
8	4	15	--
10	6	18	--
12	8.5	18	--
14	11.5	24	--
16	15	24	--

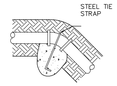
NOTE:
ALL VALUES SHOWN ARE MIN. FOR A HYDROSTATIC PRESSURE OF 150 P.S.I. AND A SOIL RESISTANCE OF 2,000 LBS. PER SQ./FT. WITH PIPELINE HAVING A MIN. OF 3 FT. OF COVER WITH CURB & GUTTER AND A 5 FT. MIN. WITHOUT CURB & GUTTER

THRUST BLOCKS DETAILS

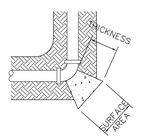
NOTE: SEE THRUST BLOCK SIZE CHART FOR PROPER THICKNESS AND SURFACE AREAS



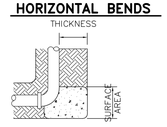
TEES & DEAD ENDS



VERTICAL BENDS



HORIZONTAL BENDS



HYDRANT BURYS

FILE NAME:	
DATE:	3/2/19
SURVEYED BY:	
DESIGNED BY:	IF
DRAWN BY:	IF
REVISED BY:	IP
CHECKED BY:	IP

TITLE:
EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
WATER DETAILS

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
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TBPE REG. NO. F-13016

SCALE:	
FULL:	N.T.S.
HALF:	N.T.S.

TBPE REG. NO. F-13016

STATE OF TEXAS
ISAEL POSADAS
89435
LICENSED PROFESSIONAL ENGINEER
5/15/19

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DATE: 8/15/19

SHEET NO.:
24 OF 37

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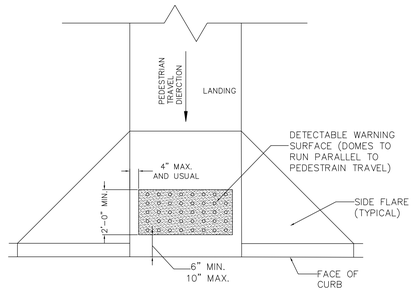
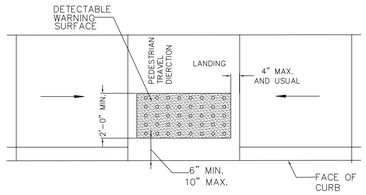
GENERAL NOTES FOR DETECTABLE WARNINGS

1. CURB RAMPS MUST CONTAIN A DETECTABLE WARNING SURFACE THAT CONSISTS OF RAISED TRUNCATED DOMES COMPL YING WITH SECTION 4.29 OF THE TEXAS ACCESSIBILITY STANDARDS (TAS). THE SURFACE MUST CONTRAST VISUALLY \11TH ADJOINING SURFACES, INCLUDING SIDE FLARES. FURNISH DARK BROWN DR DARK RED DETECTABLE WARNING SURFACE ADJACENT TO UNCOLORED CONCRETE, UNLESS SPECIFIED ELSEWHERE IN THE PLANS.
2. DETECTABLE WARNING SURFACES MUST BE SLIP RESISTANT AND NOT ALLOW WATER TO ACCUMULATE.
3. ALIGN TRUNCATED DOMES IN THE DIRECTION OF PEDESTRIAN TRAVEL WHEN ENTERING THE STREET.
4. SHADED AREAS ON SHEET 1 OF 4 INDICATE THE APPROXIMATE LOCATION FOR THE DETECTABLE WARNING SURFACE FOR EACH CURB RAMP TYPE.
5. DETECTABLE WARNING SURFACES SHALL BE A MINIMUM OF 24" IN DEPTH IN THE DIRECTION OF PEDESTRIAN TRAVEL, AND EXTEND THE FULL \\10TH OF THE CURB RAMP OR LANDING WHERE THE PEDESTRIAN ACCESS ROUTE ENTERS THE STREET.
6. DETECTABLE WARNING SURFACES SHALL NE LOCATED SO THAT THE EDGE NEAREST THE CURB LINE IS A MINIMUM OF 6" AND A MAXIMUM OF 10" FROM THE EXTENSION OF THE FACE OF CURB. DETECTABLE WARNING SURFACES MAY BE CURVED ALONG THE CORNER RADIUS.
7. TXDOT MAINTAINS A UST A QUALIFIED DETECTABLE WARNING MATERIALS. DETAILS ARE PROVIDED HEREIN FOR THE PLACEMENT OF LANDSCAPE POWERS. FOR OTHER MATERIALS, REFER TO THE MANUFACTURER'S PRODUCT MANUAL FOR PROPER INSTALLATION.



TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN

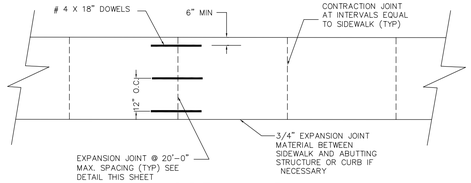


TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE

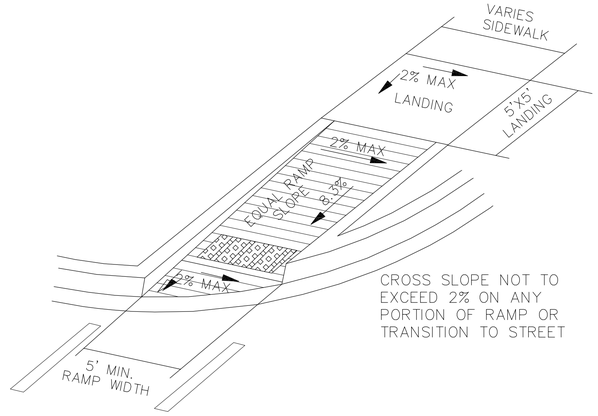
SIDEWALK NOTES:

NOI 10 SCALE

1. MINIMUM 4' –0" WIDE SIDEWALK.
2. SIDEWALK GRADIENT SHALL NOT EXCEED 1: 20.
3. SIDEWALK CONCRETE SHALL BE 5 SACK CEMENT MIX AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 psi @28 days.
4. CONTRACTOR SHALL VERIFY EXISTENCE AND LOCA 1ION OF EXISTING UTILITY LINES WITH APPROPRIATE COMPANIES TO AVOID PLACING SIDEWALKS ON TOP OF LINES.
5. PROVIDE DROP CURBS AT INTERSEC1IONS.
6. CONTRACTOR SHALL COMPLY WITH LATEST REGULATIONS AS SET FORTH IN AMERICANS WITH DISABILITIES ACT (ADA).



SIDEWALK PLAN
NOT TO SCALE

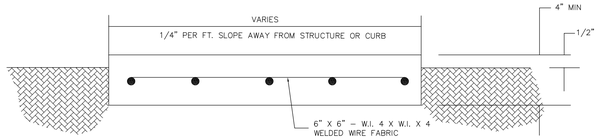


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP OR TRANSITION TO STREET

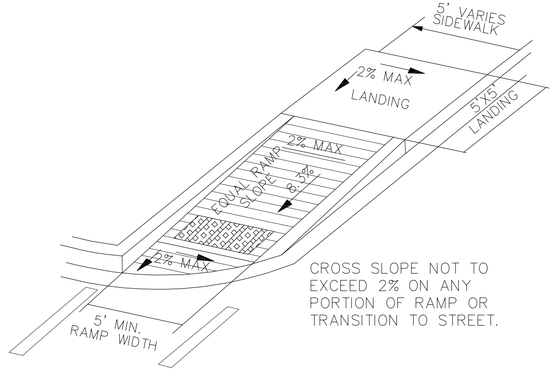
DIRECTIONAL RAMP WITHIN RADIUS (SIDEWALK SET BACK FROM CURB NOT TO SCALE

CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP OR TRANSITION TO STREET.

PARALLEL CURB RAMP
NOT TO SCALE

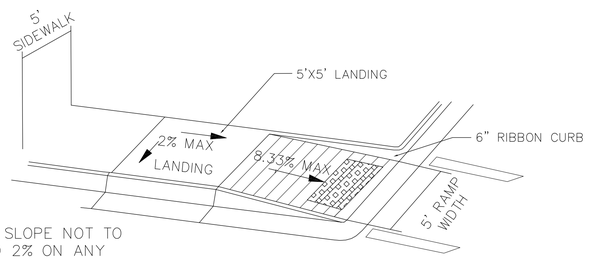


CONCRETE SIDEWALK
NOT TO SCALE



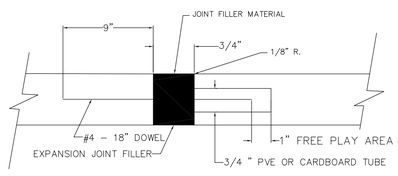
CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP OR TRANSITION TO STREET.

DIRECTIONAL RAMP WITHIN RADIUS (SIDEWALK ADJACENT TO CURB) NOT TO SCALE

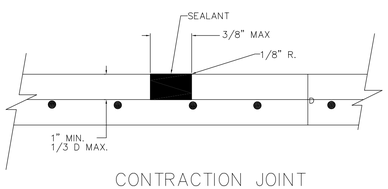


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP OR TRANSITION TO STREET.

TYPICAL CORNER SIDEWALK RAMP
NOT TO SCALE



EXPANSION JOINT

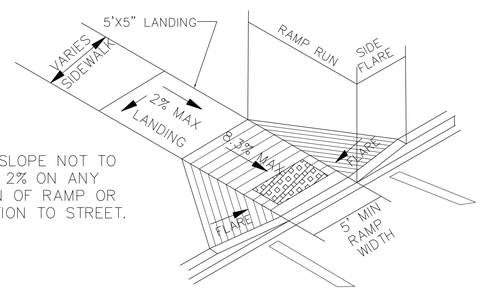


CONTRACTION JOINT

EXPANSION /CONTRACTION JOINT NOTES:

1) JOINT FILLER: TYPE C, ASTM D1752; PRE MOLDED SPONGE RUBBER, FULLY COMPRESSIBLE WITH RECOVERY RATE OF MINIMUM 95 %, OR APPROVED EQUAL.
2) SEALANT: ASTM D1190; HOT APPLIED, RUBBER; SYNTHETIC RUBBER; ASPHALT; POLYMER BASED ASPHALT; COAL TAR AND RUBBER COMPOUND, OR APPROvED EQUAL.
3) MIX CONCRETE IN ACCORDANCE WITH ACI 304. DELIVER CONCRETE IN ACCORDANCE WITH ASTM C94.

EXPANSION/CONTRACTION JOINT DETAIL
NOT TO SCALE



PERPENDICULAR CURB RAMP
NOT TO SCALE

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TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
SIDEWALK DETAILS

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE:	
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TBPE REG. NO. F–13016

STATE OF TEXAS ISAEL POSADAS 89435 LICENSED PROFESSIONAL ENGINEER

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DATE: 8/15/19

SHEET NO.: 25 OF 37

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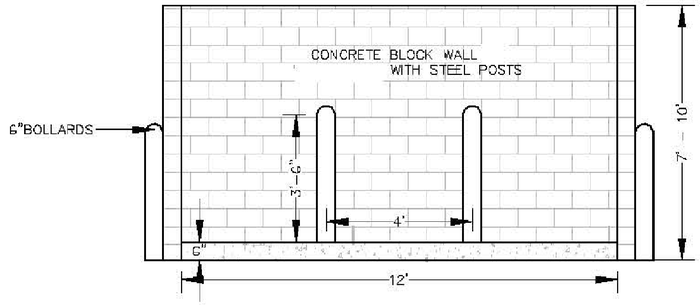
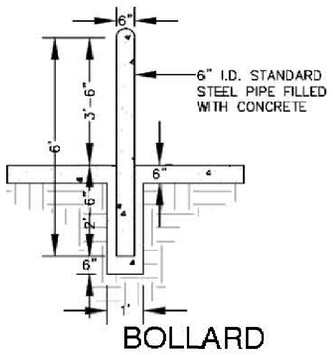


SECTION

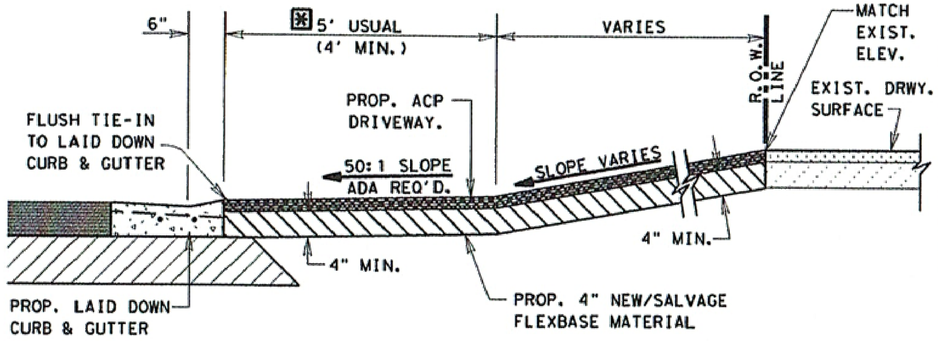
SINGLEWASTECONTAINERENCLOSURE

5 0 5

SCALE FEET

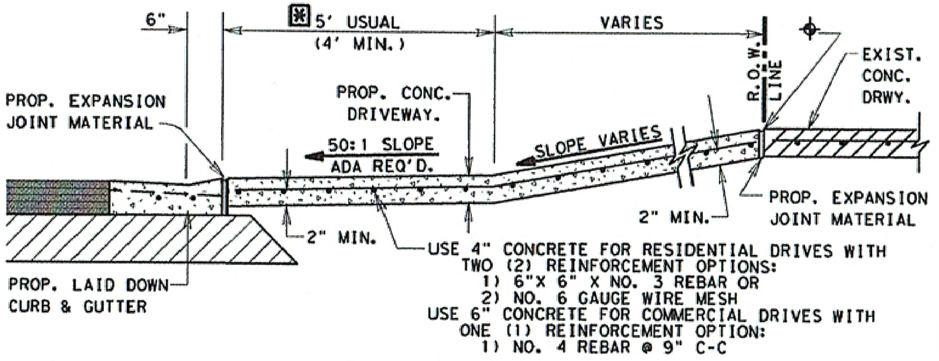


BOLLARD



TYPICAL ASPH. CONC. PVM'T. DRIVEWAY SECTION

N. T. S.

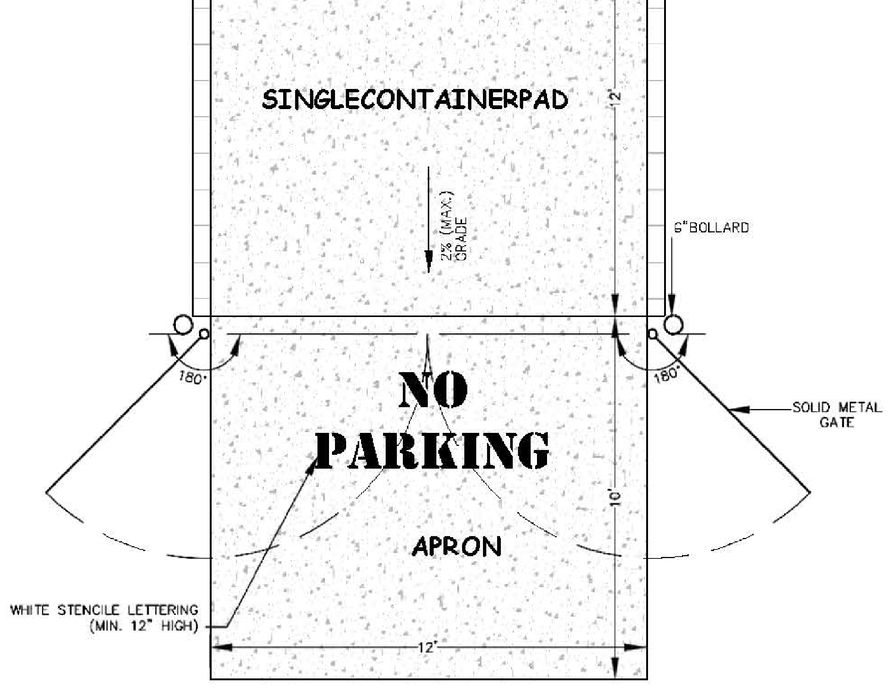


TYPICAL CONCRETE DRIVEWAY SECTION

N. T. S.

⊕ CONC. SHALL BE SAW CUT TO THE LIMITS OF REMOVAL WHERE APPLICABLE.

⊠ PROP./FUTURE SIDEWALK CROSSING LOCATION UNLESS SHOWN ELSEWHERE ON P&P SHEETS. SEE P&P SHEETS FOR PROP. SIDEWALK LOCATION IF SIDEWALKS ARE INCLUDED AS PART OF PROJECT. REFER TO STATE STANDARDS - PEDESTRIAN FACILITIES - FOR ADDITIONAL REQUIREMENTS.



PLAN

SINGLEWASTECONTAINERPADWITHENCLOSURE

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TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
DUMPSTER DETAIL

SDI ENGINEERING, LLC
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5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
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F.O.CONC.

A

B

100'-0"

16'-8" | 16'-8" | 16'-8" | 16'-8" | 16'-8" | 16'-8"

F.O.CONC. 2

F.O.CONC. 2

9 SD1.1

10 SD1.1

SLOPE 1/2"

SEE FOUNDATION NOTES FOR SLAB INFORMATION

18'-8"

56'-0"

F.F.E.=0'-0"

PROVIDE CONTRACTION JOINTS AT 15'-0" O.C.

F.O.CONC. 1

F.O.CONC. 1

A F.O.CONC.

B F.O.CONC.

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TITLE:

EDINBURG ECONOMIC DEVELOPMENT CORP

NORTH PARK SPORT COMPLEX

BASKETBALL COURT FOUNDATION

SDI ENGINEERING, LLC

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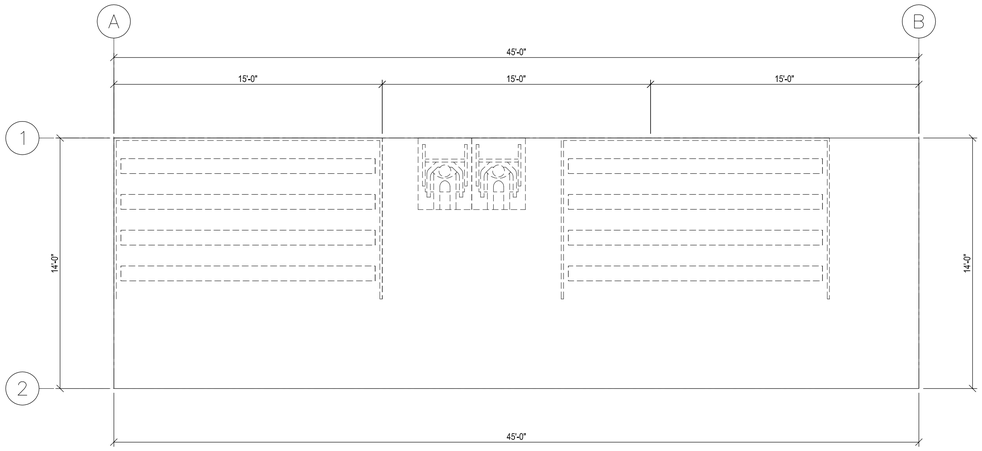
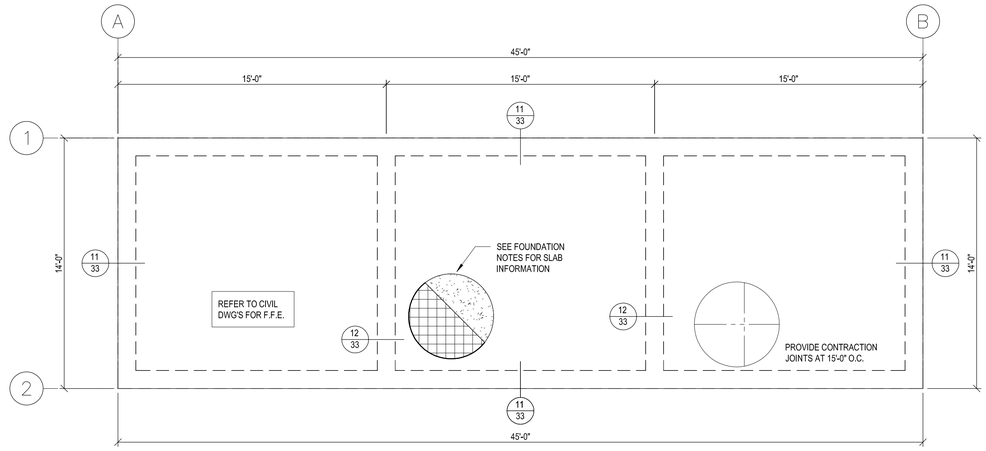


1 CONCRETE SLAB PLAN

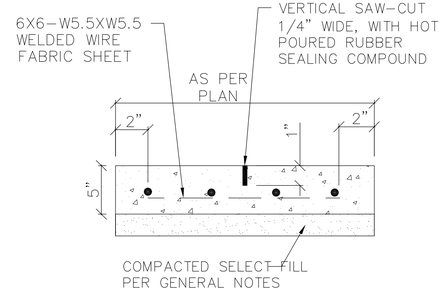
SCALE: 1/4"= 1'-0"



NOTE:
1. TWO (2) BLEACHER FOUNDATION PLANS.
2. REFER TO CIVIL DRAWINGS FOR FINISH FLOOR ELEVATION.
3. REFER TO ARCH'L DRAWINGS FOR THE TWO (2) LOCATIONS.
4. PROVIDE DETAIL 11/33 AROUND PERIMETER.
5. PROVIDE DETAIL 12/33 UNDER EACH FRAME LINE.

1 FOUNDATION PLAN

SCALE: 1/4"= 1'-0"



NOTE

1. CONCRETE SHALL HAVE 3000 PSI COMPRESSIVE STRENGTH AT 28 DAYS.
2. COMPACTED SELECT FILL SHALL BE COMPACTED TO 90% STANDARD PROCTOR.

CONTROL JOINT
(PER PLAN)

FILE NAME:	
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TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
BLEACHERS FOUNDATION PLAN

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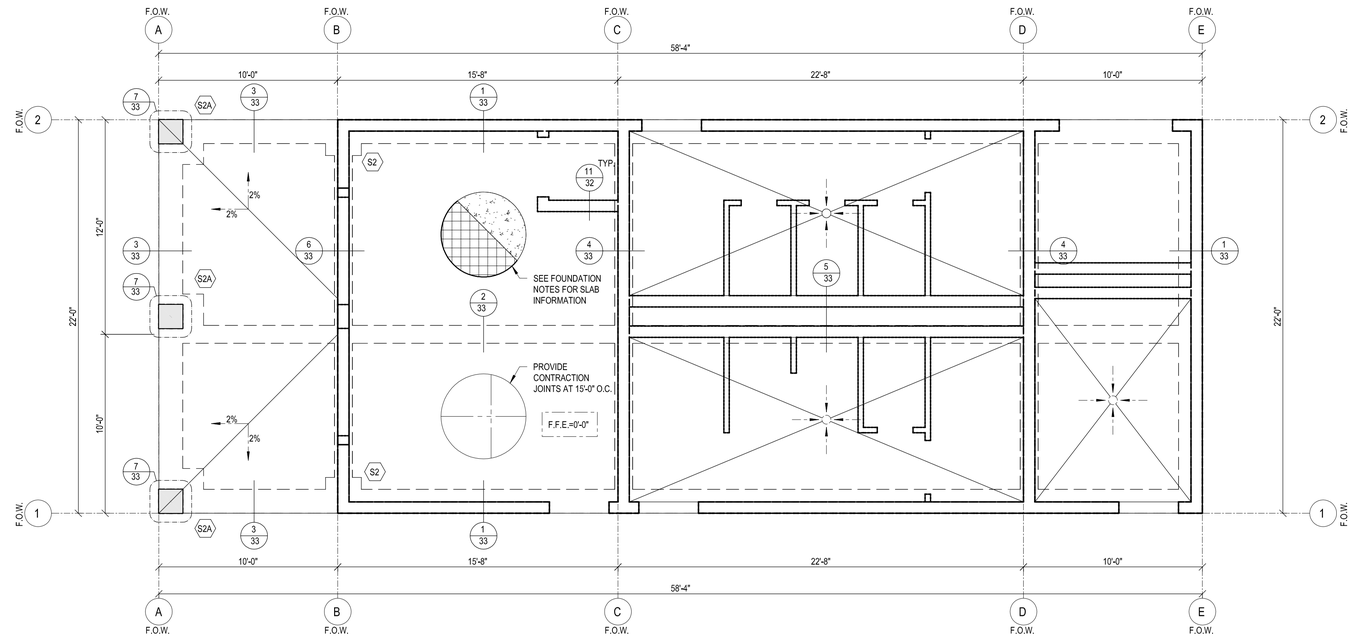
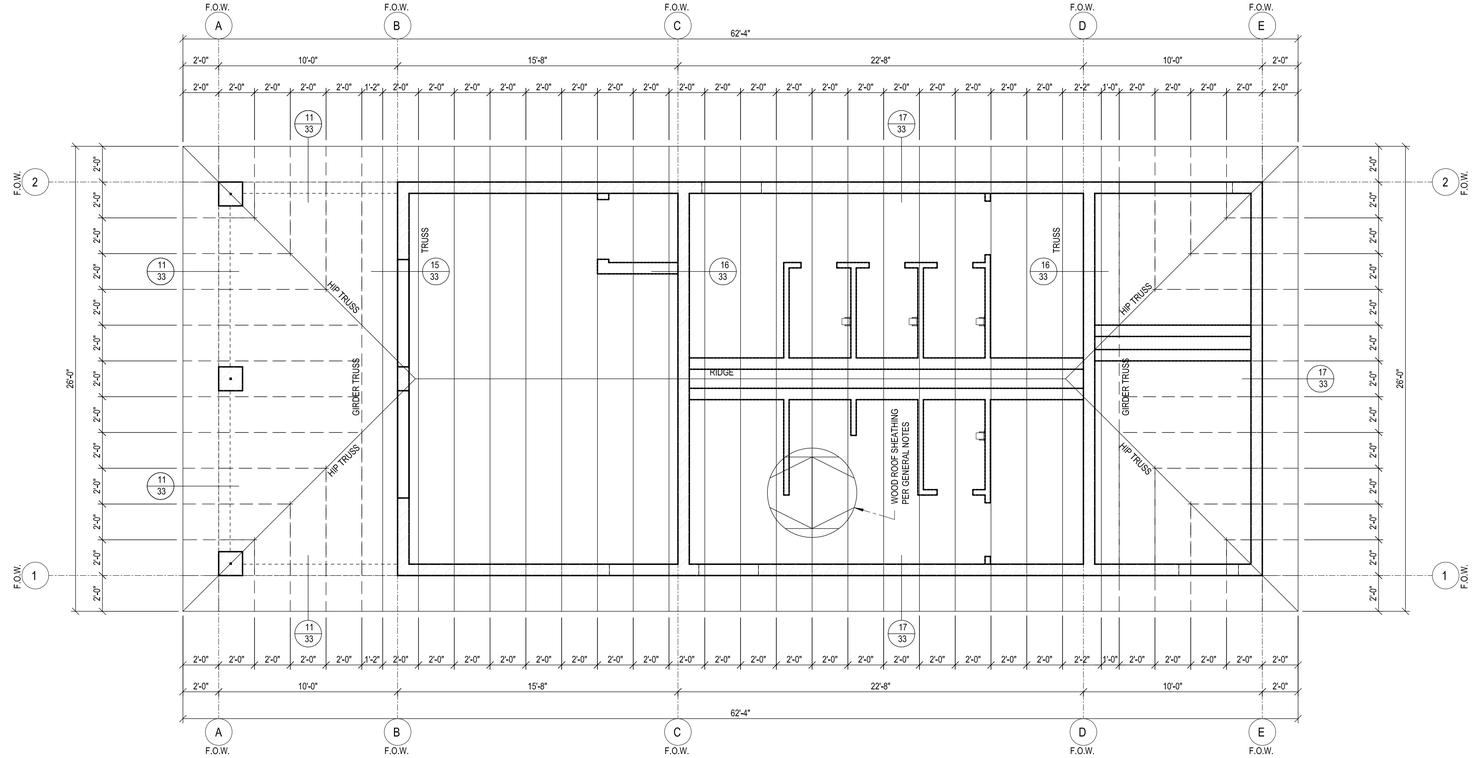
DATE: 8/15/19

SHEET NO.: 28 OF 37



1 FOUNDATION PLAN

SCALE: 1/4"= 1'-0"



1 FRAMING PLAN

SCALE: 1/4"= 1'-0"

FILE NAME:

DATE: 7/29/19

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RESTROOM & CONCESSION FOUNDATION

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STATE OF TEXAS
ISAEL POSADAS
89435
LICENSED PROFESSIONAL ENGINEER

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DATE: 8/15/19

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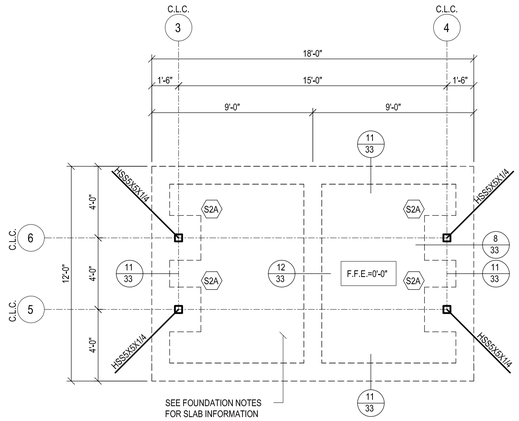
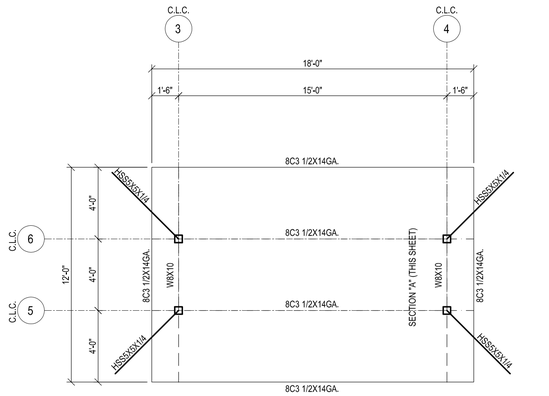
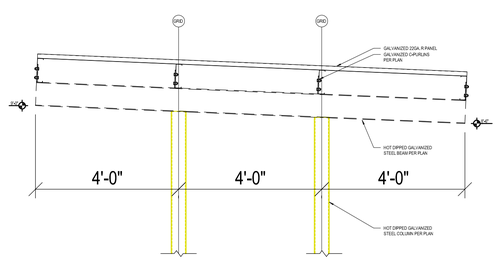


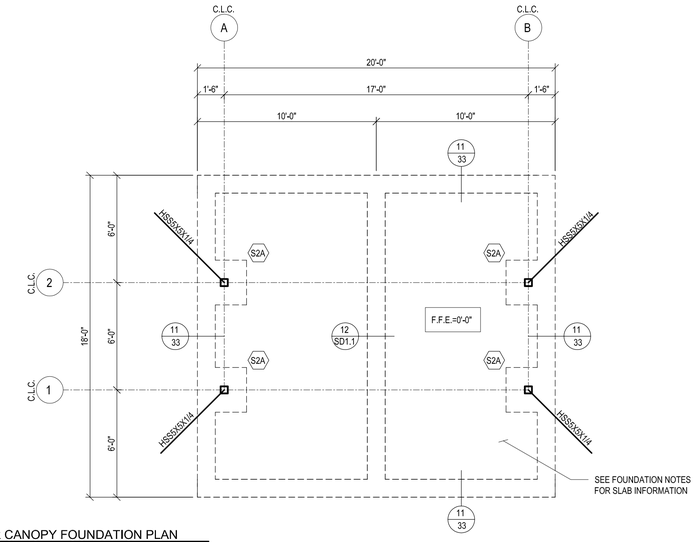
COVER CANOPY FOUNDATION PLAN
1/4" = 1'-0"



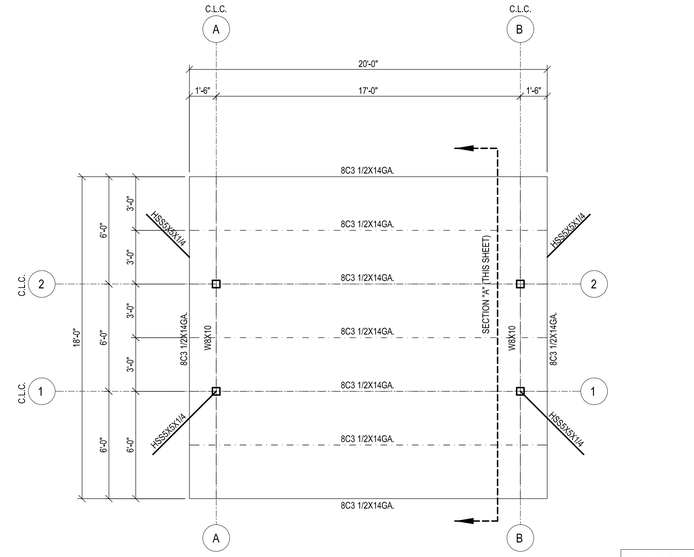
COVER CANOPY FRAMING PLAN
1/4" = 1'-0"



FRAMING SECTION DETAIL
(SECTION "A")

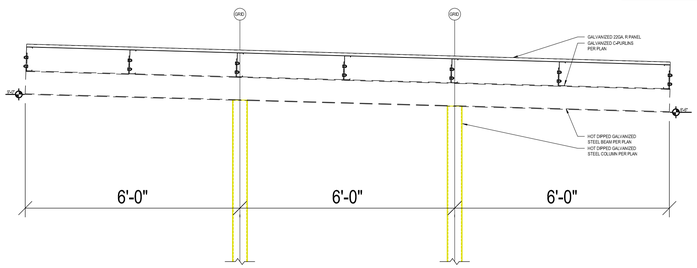


COVER CANOPY FOUNDATION PLAN
1/4" = 1'-0"



COVER CANOPY FRAMING PLAN
1/4" = 1'-0"

NOTE: ALL STEEL TO BE GALVANIZED.



FRAMING SECTION DETAIL
(SECTION "A")

FILE NAME:
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TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
COVER CANOPY STRUCTURAL PLANS

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ISAEL POSADAS
89435
LICENSED
PROFESSIONAL
ENGINEER
STATE OF TEXAS

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30 OF 37

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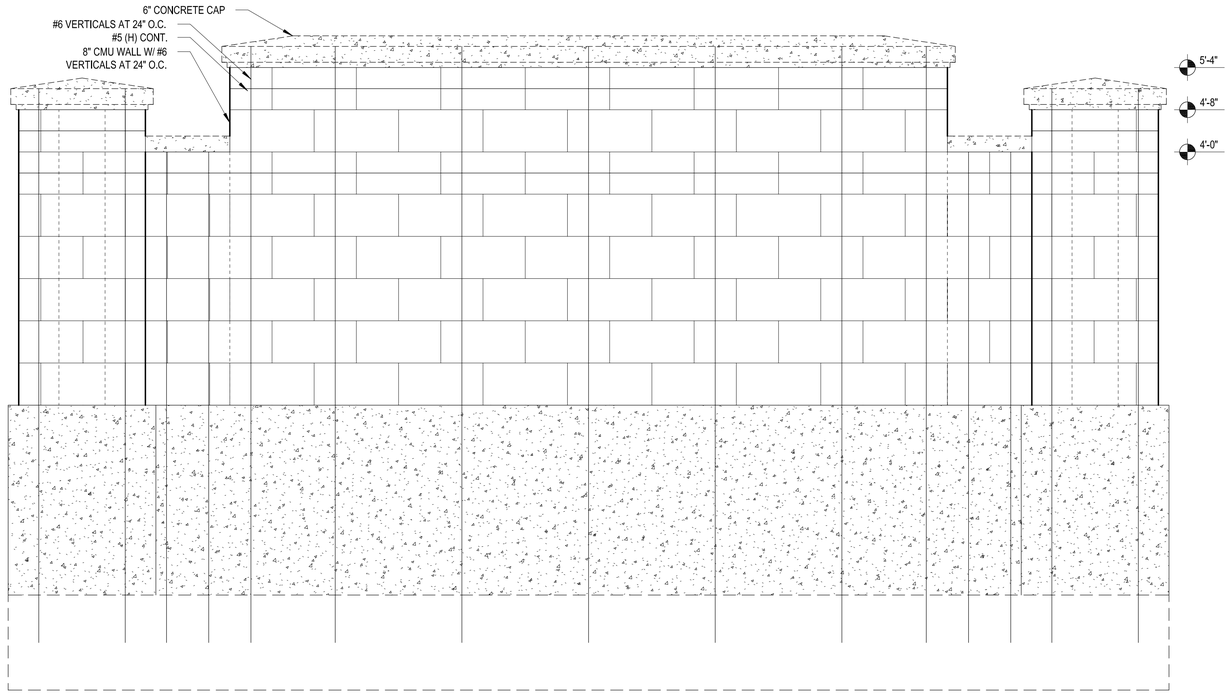
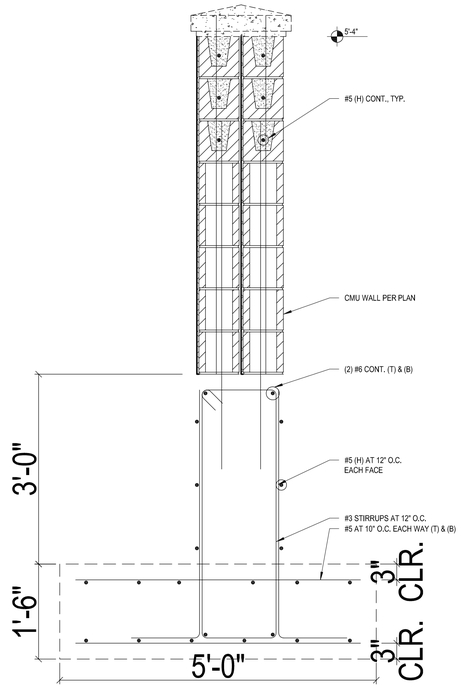
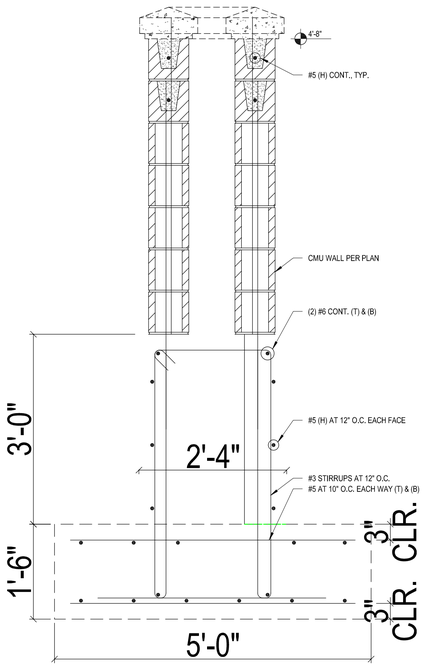


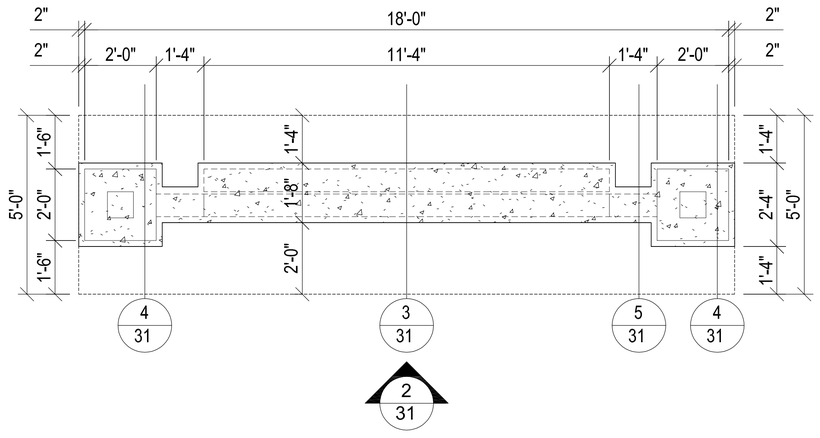
2 ELEVATION PROFILE



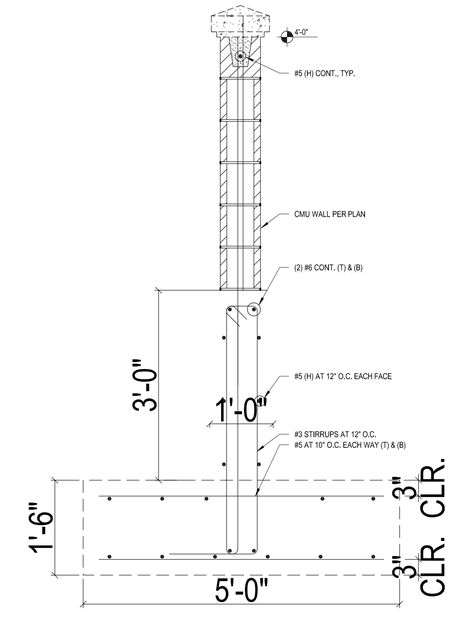
3 FOUNDATION SECTION DETAIL



4 FOUNDATION SECTION DETAIL



MONUMENTAL ENTRANCE SIGN
1 FOUNDATION PLAN
1/4" = 1'-0"



5 FOUNDATION SECTION DETAIL

FILE NAME:	
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TITLE:
EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
ENTRANCE MONUMENT SIGN

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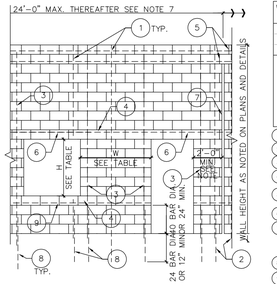
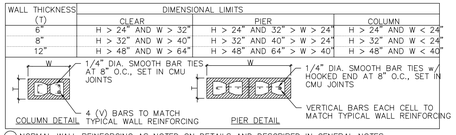
31 OF 37

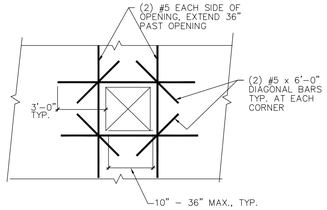


WALL THICKNESS	DIMENSIONAL LIMITS		
	CLEAR	PIER	COLUMN
(1)			
6"	H > 24" AND W > 32"	H > 24" AND 32" > W > 24"	H > 24" AND W < 24"
8"	H > 32" AND W > 40"	H > 32" AND 40" > W > 24"	H > 32" AND W < 24"
12"	H > 48" AND W > 64"	H > 48" AND 64" > W > 40"	H > 48" AND W < 40"

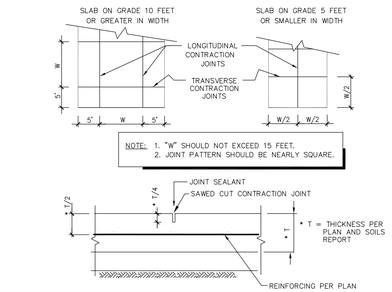


1. NORMAL WALL REINFORCING AS NOTED ON DETAILS AND DESCRIBED IN GENERAL NOTES.
2. ADDITIONAL VERTICAL REINFORCING AT CONTROL JOINTS – SEE TYPICAL CONTROL JOINT DETAIL.
3. ADDITIONAL VERTICAL REINFORCING AT JAMBS OF ALL WALL OPENINGS.
4. INTERMEDIATE BOND BEAM REINFORCED AND SPACED AS REQUIRED ON DRAWINGS. ONE INTERMEDIATE BOND BEAM SHALL BE PLACED AT WINDOW LINTEL ELEVATION AND AT 8'-0" O.C.
5. ROOF LEVEL BOND BEAM REINFORCED AS NOTED ON DETAILS– CONTINUE ALL REINFORCING UNCUT THROUGH CONTROL JOINTS.
6. LINTEL REINFORCING AS DETAILED AND/OR SCHEDULED.
7. CONTROL JOINTS (C.J.): UNLESS NOTED OTHERWISE ON THE ARCHITECTURAL DRAWINGS, THE C.J. SPACING NOTED IS THE MAXIMUM PERMITTED. THE SPACING OF C.J.'S SHALL BE COORDINATED WITH THE WALL OPENING LOCATIONS AND IN NO CASE SHALL A C.J. BE LOCATED CLOSER THAN 24" TO THE JAMB OF ANY WALL OPENING.
8. FOUNDATION DOWELS TO MATCH VERTICAL WALL REINFORCING SIZE AND SPACING.
9. SILL LEVEL BOND BEAM REINFORCED AS NOTED IN MASONRY GENERAL NOTES.

ELEVATION OF TYPICAL MASONRY WALL REINFORCING | 13

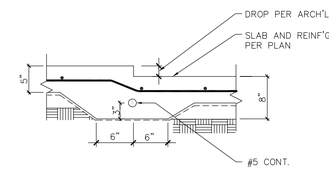


REINFORCING AT CONCRETE OPENINGS | 9



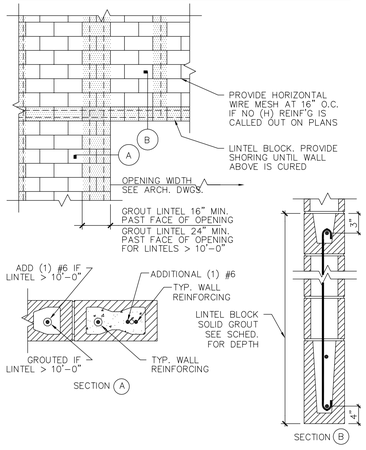
(THIS DETAIL TO BE USED ONLY IN THE ABSENCE OF ARCH'L INFO. FOR CONTRACTION JOINTS)

SLAB CONTRACTION JOINT | 5

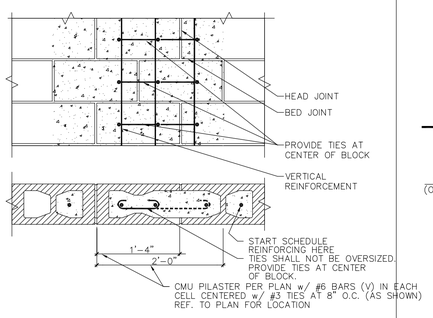


TYPICAL DROP AT SLAB ON GRADE | 1

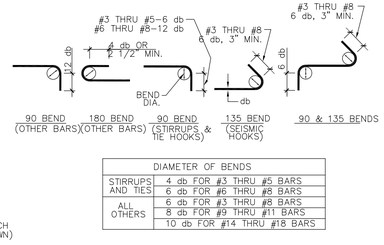
CLEAR SPAN	WIDTH	DEPTH	REINFORCING	#3 TIES AT:	REMARKS
<3'-4"	8"	8"	(1) #6		
<4'-8"	8"	16"	(1) #6 (T) & (B)	8"	
<6'-8"	8"	24"	(1) #7 (T) & (B)	8"	
<10'-0"	8"	32"	(1) #7 (T) & (B)	8"	
<16'-0"	8"	32"	(1) #7 (T) & (B)	8"	
<3'-4"	12"	8"	(2) #5		
<4'-6"	12"	16"	(2) #5 (T) & (B)	8"	
<6'-8"	12"	24"	(2) #7 (T) & (B)	8"	
<12'-0"	12"	32"	(2) #7 (T) & (B)	8"	



TYPICAL CMU LINTEL SCHEDULE AND DETAILS | 19

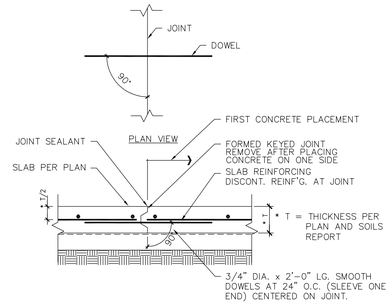


TYPICAL FLUSH WALL PILASTER | 14

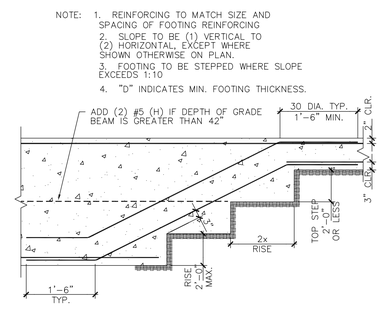


DIAMETER OF BENDS	
STIRRUPS AND TIES	4 db FOR #3 THRU #5 BARS
	6 db FOR #6 THRU #8 BARS
ALL OTHERS	6 db FOR #3 THRU #8 BARS
	8 db FOR #9 THRU #11 BARS
	10 db FOR #14 THRU #18 BARS

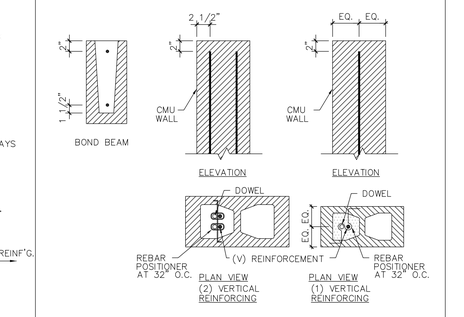
STANDARD HOOKS | 10



SLAB CONSTRUCTION JOINT | 6



TYPICAL STEPPED WALL FOOTING | 2



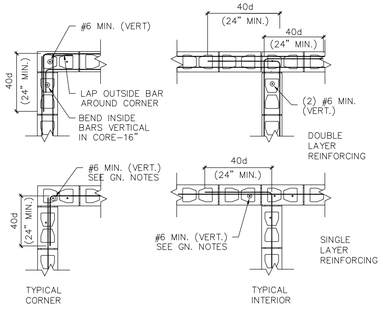
TYPICAL CMU CONTROL JOINT (C.J.) | 20

* ANGLE SIZE (LLV)	CLEAR OPENING		REMARKS
	GREATER THAN	UP TO	
7" x 4" x 3/8"	---	3'-0"	8" MIN. BRG. EA. END
7" x 4" x 3/8"	3'-1"	6'-0"	12" MIN. BRG. EA. END
8" x 8" x 1/2"	6'-1"	8'-0"	12" MIN. BRG. EA. END
8" x 8" x 1/2"	8'-1"	9'-0"	16" MIN. BRG. EA. END
8" x 8" x 1/2"	9'-1"	10'-0"	16" MIN. BRG. EA. END
8" x 8" x 1/2"	10'-1"	11'-0"	16" MIN. BRG. EA. END
8" x 8" x 1/2"	11'-1"	12'-0"	16" MIN. BRG. EA. END

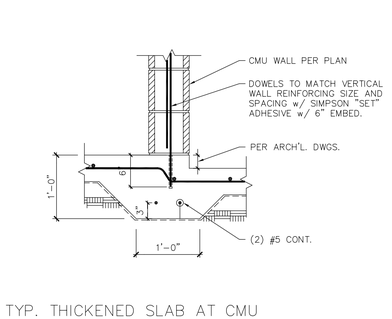
*FOR EACH 4" WIDTH OF MASONRY
SEE ARCHITECTURAL PLANS FOR MASONRY OPENING DIMENSIONS, LOCATION, AND QUANTITIES.
1. CUT HORIZONTAL LEG 1/4" FROM OUTSIDE FACE OF VENEER
NOTE: ALL STEEL SHALL BE HOT DIP GALVANIZED

LOOSE ANGLE LINTEL SCHEDULE | 15

TYPICAL REINF'G. PLACEMENT AND CLEARANCE | 16

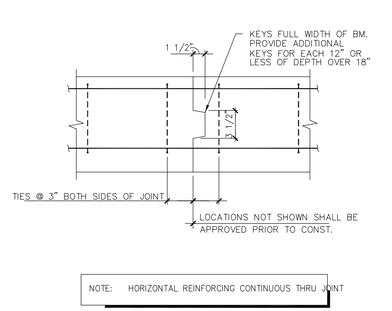


TYPICAL REINF'G. AT INT. OF CMU WALLS | 12



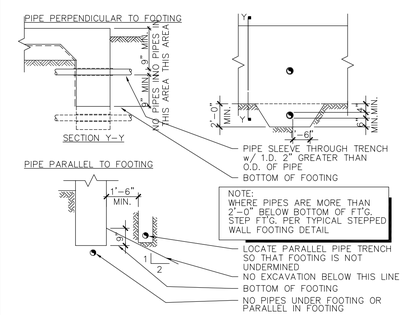
TYP. THICKENED SLAB AT CMU

WALL AT DROP | 8

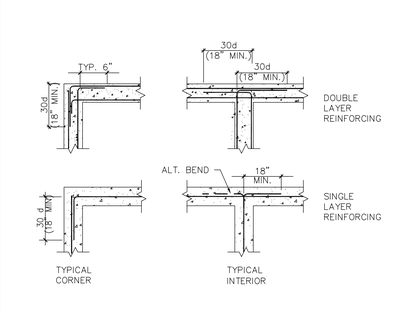


TYP. THICKENED SLAB AT NON

BEARING CMU WALL | 11



TYPICAL PIPING AT FOOTING | 3



TYPICAL REINF. AT INT. OF CONC. FT'GS. | 4

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INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

FILE NAME:
DATE: 7/29/19
SURVEYED BY:
DESIGNED BY: IF
DRAWN BY: IF
REVISED BY: IP
CHECKED BY: IP

TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
STRUCTURAL TYPICAL DETAILS

SCALE: FULL: N.T.S. HALF: N.T.S.

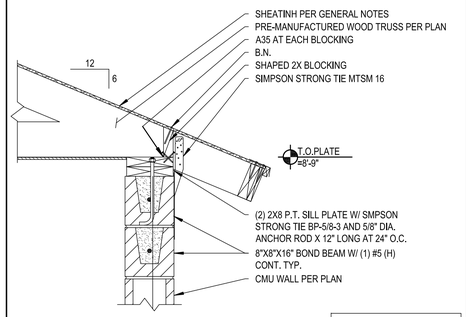
TBPE REG. NO. F–13016

THIS SEAL APPLIES ONLY TO THIS DOCUMENT AND AUTHORIZED BY ISAEL POSADAS, P.E. No. 89435 ON AUGUST 15, 2019. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION OF THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

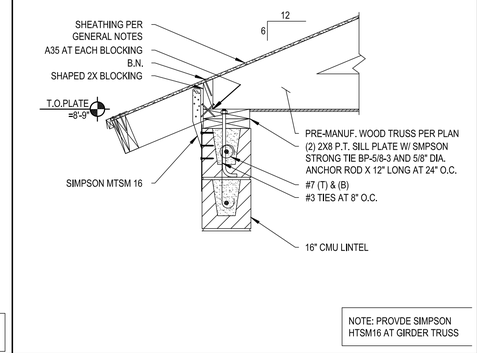
DATE: 8/15/19

SHEET NO.: 32 OF 37

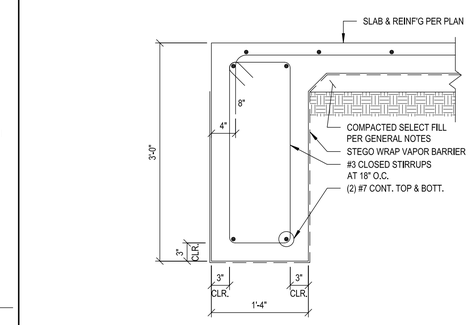
Z:\SDI Files\SDI Projects\19-004 EEDC North Park\3 Drawings\Basketball Court-Foundation Sht 27-37.dwg – Aug 15, 2019 – 2:34PM



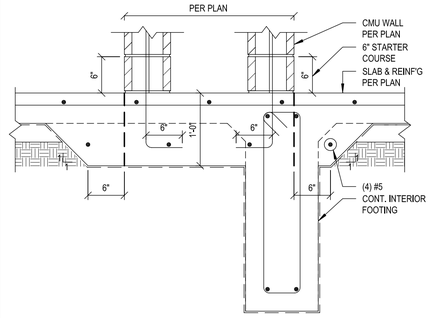
17 CMU WALL TO WOOD TRUSS



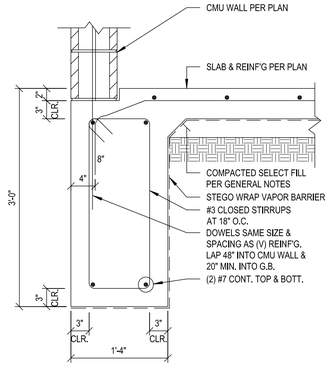
13 WOOD TRUSS TO CMU LINTEL



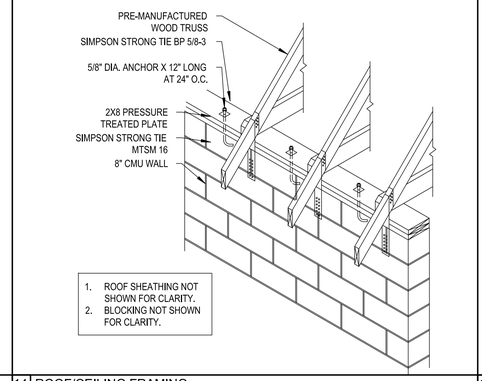
9 EXTERIOR GRADE BEAM



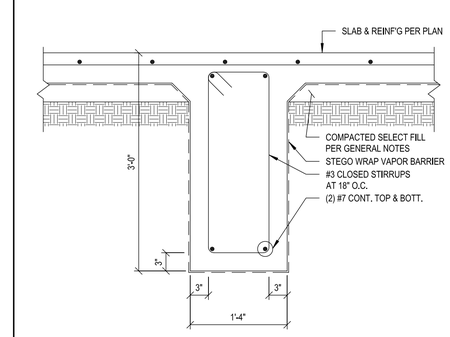
5 TYP. INTERIOR FOOTING AT CHASE (RESTROOMS) FOR ADDITIONAL INFO SEE DETAIL 1/SD1.1



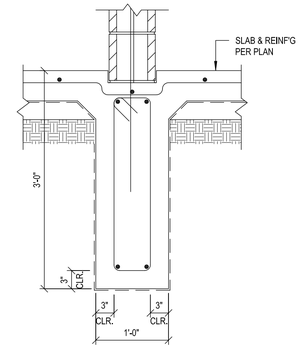
1 EXTERIOR GRADE BEAM (RESTROOMS)



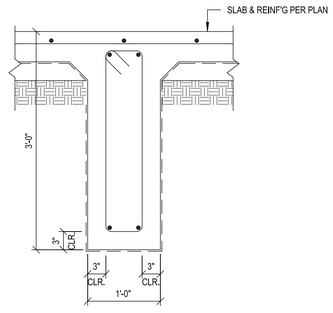
14 ROOF/CEILING FRAMING



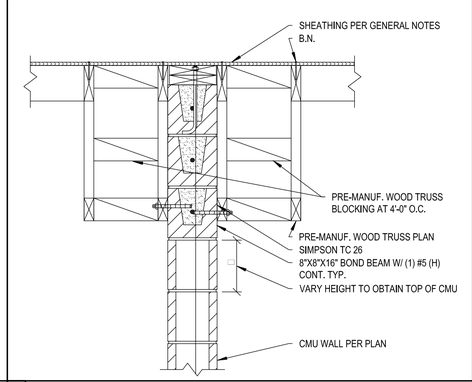
10 INTERIOR GRADE BEAM



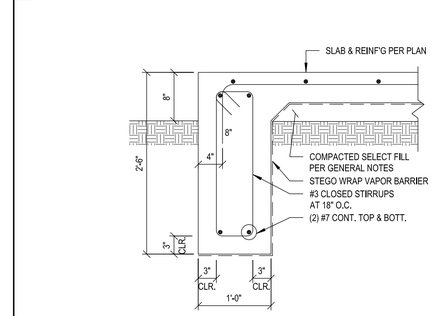
6 INTERIOR GRADE BEAM FOR ADDITIONAL INFO SEE DETAIL 1/SD1.1



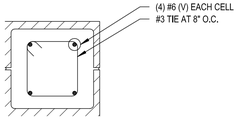
2 INTERIOR GRADE BEAM (RESTROOMS) FOR ADDITIONAL INFO SEE DETAIL 1/SD1.1



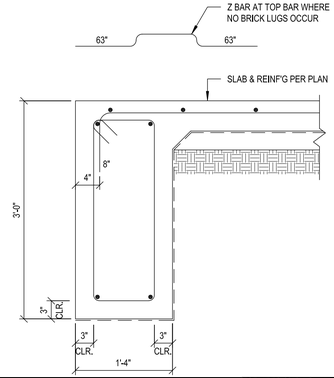
15 CMU WALL TO ROOF



11 EXTERIOR GRADE BEAM (BLEACHERS)



7 16" x 16" CMU PILASTER

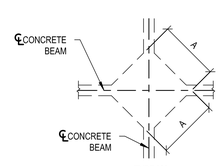


3 EXTERIOR GRADE BEAM (RESTROOMS) FOR ADDITIONAL INFO SEE DETAIL 1/SD1.1

FOOTING SCHEDULE

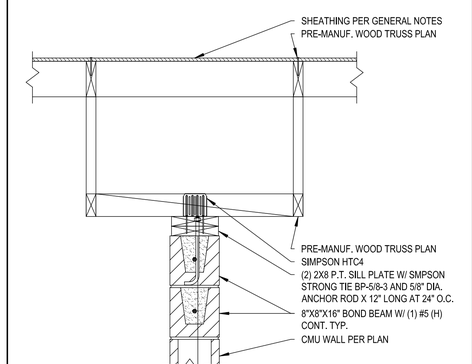
TYPE	A	B	C	D	REINFORCING
S2	2'-0"			3'-0"	#5'S @ 12" O.C. E.W. TOP & BOTT.
S2A	2'-6"			3'-0"	#5'S @ 12" O.C. E.W. TOP & BOTT.

NOTES:
1. D= FOOTING BELOW FINISH FLOOR.
2. FOOTING DIMENSIONS ARE FOR BIDDING PURPOSES ONLY. ACTUAL DIMENSION MAY VARY.
3. PROVIDE UNIT PRICES (ON A CUBIC YARD BASIS) FOR REINFORCED (#5'S @ 12" O.C. E.W. TOP & BOTT.) WIDENED BEAM CONCRETE FOOTINGS.

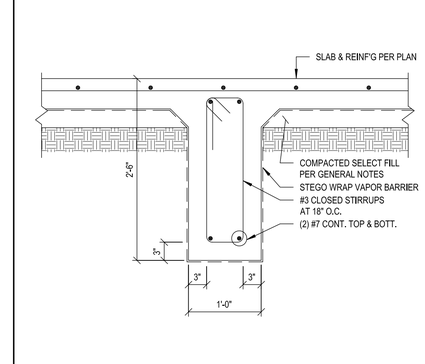


WIDENED BEAM FOOTINGS

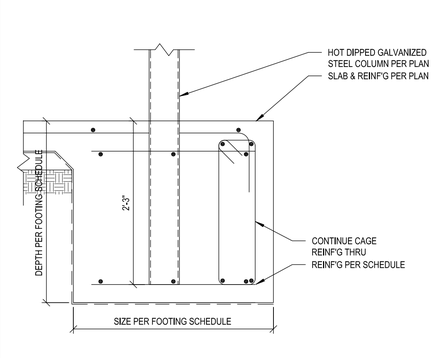
20 FOOTING SCHEDULE



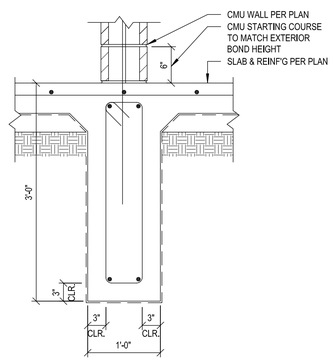
16 CMU WALL TO WOOD TRUSS



12 INTERIOR GRADE BEAM (BLEACHERS)



8 FOOTING AT STEEL COLUMN



4 INTERIOR GRADE BEAM (RESTROOMS) FOR ADDITIONAL INFO SEE DETAIL 1/SD1.1

FILE NAME:
DATE: 7/29/19
SURVEYED BY:
DESIGNED BY: IF
DRAWN BY: IF
REVISED BY: IP
CHECKED BY: IP

TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
FOUNDATION & FRAMING DETAILS

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
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INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE: FULL: N.T.S.
HALF: N.T.S.

TBPE REG. NO. F-13016

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DATE: 8/15/19

SHEET NO.: 33 OF 37

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GENERAL NOTES

1. THESE CONTRACT STRUCTURAL DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE, UNLESS OTHERWISE INDICATED, THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE, WORKMEN, AND OTHER PERSONS DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, BRACING, SHORING FOR EARTH BANKS, FORMS, SCAFFOLDING, PLANKING SAFETY NETS, SUPPORT AND BRACING FOR CRANES, POLES, ETC. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES. OBSERVATION VISITS TO THE SITE BY THE ARCHITECT OR THE ENGINEER DO NOT INCLUDE INSPECTION OF THE ABOVE AND BELOW ITEMS.
2. ALL CONSTRUCTION AND QUALITY OF MATERIALS SHALL COMPLY WITH THE GOVERNING BUILDING CODES AND REGULATIONS.
3. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS, TOLERANCES AND CONDITIONS AT THE JOB SITE BEFORE COMMENCEMENT OF WORK AND SHALL IMMEDIATELY REPORT ANY DISCREPANCIES OR OMISSIONS TO THE ARCHITECT AND ENGINEER IN WRITING BEFORE PROCEEDING WITH THAT PORTION OF THE WORK. ANY OMISSION OR CONFLICT BETWEEN THE VARIOUS ELEMENTS OF THE WORKING DRAWINGS AND/OR SPECIFICATIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE PROCEEDING WITH ANY WORK SO INVOLVED.
4. IN CASE OF CONFLICT; NOTES AND DETAILS ON THE BALANCE OF THE DRAWINGS TAKE PRECEDENCE OVER GENERAL NOTES AND TYPICAL DETAILS. DRAWINGS TAKE PRECEDENCE OVER SPECIFICATIONS. IN CASE OF A CONFLICT ON THE SAME ITEM, THE MORE STRINGENT OR MORE EXPENSIVE ITEM GOVERNS.
5. WHERE CONSTRUCTION DETAILS ARE NOT SPECIFICALLY SHOWN OR NOTED FOR ANY PART OF THE WORK, SUCH DETAILS SHALL BE CONSTRUCTED IN ACCORDANCE WITH DETAILS SHOWN FOR SIMILAR CONDITIONS AND MATERIALS. WHERE SUFFICIENTLY SIMILAR WORK IS NOT SHOWN, THE ENGINEER SHALL BE CONSULTED FOR CLARIFICATION.
6. EACH SUBCONTRACTOR IS CONSIDERED AN EXPERT IN THEIR RESPECTIVE FIELD AND SHALL PRIOR TO THE SUBMISSION OF A BID OR PERFORMANCE OF WORK, NOTIFY THE GENERAL CONTRACTOR, ARCHITECT, ENGINEER OR OWNER, IN WRITING OF ANY WORK CALLED OUT ON THE DRAWINGS IN THEIR TRADE THAT CANNOT BE GUARANTEED OR PERFORMED AS INDICATED.
7. THE CONTRACTOR SHALL COORDINATE ALL MECHANICAL AND ELECTRICAL EQUIPMENT, AS TO WEIGHTS AND EXACT LOCATIONS, WITH STRUCTURAL SUPPORTS. IN THE EVENT THAT THE PURCHASED EQUIPMENT DEVIATES IN WEIGHT AND LOCATION FROM THOSE INDICATED ON THE PLANS, THE ARCHITECT AND ENGINEER MUST BE NOTIFIED AND APPROVAL OBTAINED PRIOR TO INSTALLATION.
8. THIS STRUCTURE IS DESIGNED AS A STABLE UNIT AFTER ALL COMPONENTS ARE IN PLACE. THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE TEMPORARY BRACING AS REQUIRED TO INSURE THE VERTICAL AND LATERAL STABILITY OF THE ENTIRE STRUCTURE, OR ANY PORTION THEREOF, DURING CONSTRUCTION.
9. NEITHER THE OWNER NOR THE ARCHITECT NOR THE ENGINEER WILL ENFORCE SAFETY MEASURES OR REGULATIONS. THE CONTRACTOR SHALL DESIGN, CONSTRUCT AND MAINTAIN ALL SAFETY DEVICES, INCLUDING SHORING AND BRACING, AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS.
10. TRADE NAMES AND MANUFACTURERS REFERRED TO ARE FOR QUALITY STANDARDS ONLY. SUBSTITUTIONS WILL BE PERMITTED AS APPROVED BY THE ENGINEER.
11. ANY OPTIONS OR APPROVED SUBSTITUTIONS ARE FOR CONTRACTORS CONVENIENCE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CHANGES, ADDITIONAL COSTS (INCLUDING REDESIGN BY THE ENGINEER), AND COORDINATION WITH ALL ITEMS THAT THE SUBSTITUTIONS MAY IMPACT.
12. THE ARCHITECT AND ENGINEER ARE TO BE NOTIFIED IN WRITING WHEN CONSTRUCTION AT THE SITE BEGINS.
13. ANY QUESTIONS RELATED TO INTERPRETATION OR INTENT OF THESE DRAWINGS SHALL BE REFERRED TO THE ENGINEER.
14. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO LOCATE AND PROTECT ANY EXISTING UNDERGROUND OR CONCEALED CONDUIT, PLUMBING, OR OTHER UTILITIES PRIOR TO BEGINNING ANY WORK. THE CONTRACTOR SHALL TAKE ALL THE NECESSARY PRECAUTIONS TO PROTECT EXISTING STRUCTURES ADJACENT, NEAR, OR WITHIN THE AREA OF CONSTRUCTION.
15. PIPES, DUCTS, SLEEVES, CHASES, ETC. SHALL NOT BE PLACED IN BEAMS OR WALLS UNLESS SPECIFICALLY SHOWN OR NOTED. NOR SHALL ANY STRUCTURAL MEMBER BE CUT FOR PIPES, DUCTS, ETC. UNLESS NOTED, CONTRACTOR SHALL OBTAIN PRIOR APPROVAL FOR INSTALLATION OF ANY ADDITIONAL PIPES, DUCTS, ETC.

DESIGN CRITERIA

A. DESIGN LOADS, STRUCTURAL ANALYSIS AND PREPARATIONS OF STRUCTURAL MEMBERS ARE BASED UPON THE FOLLOWING CRITERIA:

CODE: . . . . 2012 IBC
- A. STRUCTURAL LOADS: . . . . . ASCE/SEI 7-10
- B. CONCRETE: . . . . . ACI 318-11
- C. ALUMINUM: ADM1-2010
- D. MASONRY: . . . . . TMS 402-11/ACI 530-11/ASCE 5-11; TMS 602-11/ACI 530.1-11/ASCE 6-11
- E. STEEL: . . . . . AISC 325-11(14TH EDITION); ANSI/AISC 360-10 (JUNE 22, 2010)
- F. COLD-FORMED STEEL: . . . . . AISI S100-07/S2-10
- G. WOOD: . . . . . NDS-2012; ANSI/AF&PA SDPWS-2008

B. GRAVITY LOADS	UNIFORM	CONCENTRATED
1. DEAD LOADS		
ROOF	20 PSF	
WOOD TRUSS TOP CHORD	10 PSF	
WOOD TRUSS BOTTOM CHORD	10 PSF	
FOUNDATION	85 PSF	
2. ROOF LIVE LOADS		
ROOF STRUCTURE	20 PSF	
WOOD TRUSS TOP CHORD	20 PSF	
WOOD TRUSS BOTTOM CHORD	10 PSF	
SUBJECT TO MAINTENANCE WORKERS		300 LBS
ALL OTHER PRIMARY ROOF MEMBERS		300 LBS
3. LIVE LOADS		
PARTITIONS	15 PSF	
(PER ASCE 7-10 SECTION 4.3.2 A PARTITION LIVE LOAD IS NOT REQUIRED WHERE THE MINIMUM SPECIFIED LIVE LOAD EXCEEDS 80 PSF)		
ASSEMBLY AREAS		
LOBBIES	100 PSF	2,000 LBS
OTHER ASSEMBLY AREAS	100 PSF	
CORRIDORS		
FIRST FLOOR	100 PSF	2,000 LBS
RESTROOMS	80 PSF	
MECHANICAL ROOMS	250 PSF	3,000 LBS
IDF/ELECTRICAL	125 PSF	2,000 LBS
STORAGE	125 PSF	2,000 LBS
OFFICES	50 PSF	2,000 LBS
4. CANOPY		
DEAD LOAD	5 PSF	
LIVE LOAD (AWNINGS & CANOPIES)		
FABRIC CONSTRUCTION	5 PSF	
ALL OTHER CONSTRUCTION	20 PSF	
C. METAL BUILDING SYSTEM		
ROOF DEAD LOAD	SELF WEIGHT	
COLLATERAL LOAD	10 PSF	
ROOF LIVE LOAD	20 PSF	
BUILDING DRIFT		
WITH METAL SIDING	H/ 240	
WITH CMU WALLS	H/ 600	
GIRT DEFLECTION		
WITH METAL SIDING	H/ 240	
WITH CMU WALLS	H/ 600	

DESIGN CRITERIA (CONT.)

D. LATERAL LOADS

1. WIND LOAD
   - ULTIMATE DESIGN WIND SPEED, V_{ult} . . . . . 132 MPH
   - NOMINAL DESIGN WIND SPEED, V_{asd} . . . . . 107 MPH
   - RISK CATEGORY II
   - EXPOSURE CATEGORY C
   - INTERNAL PRESSURE COEFFICIENT, GC_{pi} . . . . . ± 0.18
     - A. STRUCTURE DESIGNED AS FULLY ENCLOSED.
   - COMPONENTS & CLADDING
     - A. THIS STRUCTURE IS LOCATED IN A HURRICANE PRONE REGION.
     - B. THIS STRUCTURE IS NOT LOCATED IN A WIND-BORNE DEBRIS REGION.
     - C. PROTECTION OF GLAZED OPENINGS IS NOT REQUIRED.
2. SEISMIC LOAD
   - RISK CATEGORY II
   - SEISMIC IMPORTANCE FACTOR, I_e 1.25
   - MAPPED SPECTRAL RESPONSE ACCELERATION PARAMETERS
     - A. 0.2 sec SPECTRAL RESPONSE ACCELERATION, S_s . . . . . 0.044 g
     - B. 1.0 sec SPECTRAL RESPONSE ACCELERATION, S_1 . . . . . 0.015 g
   - SITE CLASS . . . . . D
   - DESIGN SPECTRAL RESPONSE ACCELERATION PARAMETERS
     - A. DESIGN 0.2 sec SPECTRAL RESPONSE ACCELERATION, S_{DS} . . . . . 0.047 g
     - B. DESIGN 1.0 sec SPECTRAL RESPONSE ACCELERATION, S_{D1} . . . . . 0.024 g
   - SEISMIC DESIGN CATEGORY, SDC . . . . . A

ROOF COMPONENT & CLADDING GROSS WIND VALUES

ROOF ZONE		TRIBUTARY AREA 10 SF.	20 SF.	50 SF.
#1	INTERIM.	-38.0	-37.0	-35.7
#2	EDGE	-63.7	-56.9	-48.0
#3	CORNER	-95.9	-79.4	-57.7

(-) INDICATES AN UPWARD DIRECTION

*WIND PRESSURES SHOWN ARE GROSS VALUES USING LOAD RESISTANCE FACTOR DESIGN (LRFD).

*NET UPLIFT IS THE GROSS UPLIFT MINUS THE ALLOWABLE PORTION OF DEAD LOAD INCLUDING THE WEIGHT OF THE JOIST/TRUSS.

*EDGE DISTANT ("a")=6 ft.

*ALLOWABLE PORTION OF DEAD LOAD TO BE SUBTRACTED FROM GROSS UPLIFT= 3 PSF.

*ULTIMATE DESIGN WIND SPEED= 132 MPH.

1. DOORS & WINDOWS MAXIMUM DESIGN WIND PRESSURES:
   P+ = +38.0 TOWARDS THE SURFACE.
   P- = -50.9 AWAY FROM THE SURFACE.
2. THE STRUCTURE IS DESIGNED TO MEET ASCE 7-10 WIND PRESSURES. ALL COMPONENTS AND CLADDING (EX. WINDOWS, DOORS, RTU'S AND ARCHITECTURAL COPING AND ROOFING MATERIALS); SHALL MEET MINIMUM CODE REQUIREMENTS.

E. GEOTECHNICAL INFORMATION

1. GEOTECHNICAL REPORT
   - PREPARED BY: MILLENNIUM ENGINEERS GROUP, INC.
   - PROJECT No.: 01-19-29171
   - DATE: JULY 18, 2019
2. SHALLOW FOUNDATION

MINIMUM FOOTING DEPTH	24 INCHES
MINIMUM FOOTING WIDTH	12 INCHES
MAXIMUM ALLOWABLE SOIL BEARING PRESSURE	
CONCESSION / RESTROOM:	
ALLOWABLE BEARING PRESSURE (CONTINUOUS FOOTING)	2000 PSF
ALLOWABLE BEARING PRESSURE (SPREAD FOOTING)	2400 PSF
BASKETBALL AREA:	
ALLOWABLE BEARING PRESSURE (CONTINUOUS FOOTING)	2000 PSF
ALLOWABLE BEARING PRESSURE (SPREAD FOOTING)	2400 PSF
BUILDING RESEARCH ADVISORY BOARD (BRAB) CRITERIA:	
FOR EXISTING CONDITIONS:	
POTENTIAL VERTICAL RISE (PVR)	1 /34 INCH
EFFECTIVE PLASTICITY INDEX (PI)	24
CLIMATIC RATING (Cw)	15
SOIL SUPPORT INDEX, (c)	0.90
FOR PROPOSED CONDITIONS:	
POTENTIAL VERTICAL RISE (PVR)	1 INCH
EFFECTIVE PLASTICITY INDEX (PI)	21
CLIMATIC RATING (Cw)	15
SOIL SUPPORT INDEX, (c)	0.93

3. CONSTRUCTION DEWATERING
   THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING AND DESIGNING THE DEWATERING SYSTEM REQUIRED FOR THE PROJECT EXCAVATION. THE CONTRACTOR SHALL SUBMIT THE DESIGN OF THE DEWATERING SYSTEM TO THE GEOTECHNICAL ENGINEER FOR APPROVAL PRIOR TO COMMENCING EXCAVATION.

STRUCTURAL OBSERVATIONS

1. JOB SITE OBSERVATIONS BY THE PROFESSIONAL ENGINEER OR HIS AUTHORIZED REPRESENTATIVE SHALL CONSIST OF VISUAL OBSERVATION OF MATERIALS, EQUIPMENT OR CONSTRUCTION WORK FOR THE PURPOSE OF ASCERTAINING THAT THE WORK IS IN SUBSTANTIAL CONFORMANCE WITH THE CONTRACT DOCUMENTS AND WITH THE INTENT.
2. SUCH OBSERVATIONS SHALL NOT BE RELIED UPON BY OTHERS AS ACCEPTANCE OF THE WORK, NOR SHALL IT BE CONSTRUED TO RELIEVE THE CONTRACTOR IN ANY WAY FROM HIS OBLIGATIONS AND RESPONSIBILITIES UNDER THE CONSTRUCTION CONTRACT.
3. SPECIFICALLY BUT WITHOUT LIMITATION, OBSERVATIONS BY THE DESIGN PROFESSIONAL SHALL NOT REQUIRE THE DESIGN PROFESSIONAL TO ASSUME RESPONSIBILITY FOR THE MEANS AND METHODS OF CONSTRUCTION, NOR FOR SAFETY ON THE JOB SITE, NOR FOR ITEMS NOT INSTALLED OR IMPROPERLY INSTALLED BY THE CONTRACTOR OR HIS SUBCONTRACTORS.
4. NOTIFY ENGINEER 48 HOURS IN ADVANCE WHEN A STRUCTURAL OBSERVATION IS REQUIRED.
5.

CONSTRUCTION STAGE	REQUIRED
BEFORE PLACEMENT OF CONCRETE FOR SLAB/FOUNDATION	X
AFTER FRAMING OF 2ND FLOOR STRUCTURE BUT BEFORE PLACEMENT OF CONCRETE	N/A
BEFORE PLACEMENT OF FOUR (4) FEET OF GROUT IN CMU & BMU WALL	X
AFTER FRAMING OF ROOF STRUCTURE BUT BEFORE PLACEMENT OF ROOFING MATERIAL.	X

SPECIAL NOTES TO OWNER

1. UNDER NORMAL CONDITIONS, AND FOR CONVENTIONAL BUILDINGS SUCH AS THE SUBJECT MATTER, REINFORCED CONCRETE AND MASONRY DEVELOP CRACKS. THE CRACKS ARE DUE TO INHERENT SHRINKAGE OF CONCRETE, CREEP AND RESTRAINING EFFECTS OF VERTICAL AND OTHER STRUCTURAL ELEMENTS TO WHICH THE BEAMS/SLABS ARE TIED.
2. THE CRACKS FORMED ARE NORMALLY COSMETIC. THE SLAB MAINTAINS ITS SERVICEABILITY AND STRENGTH REQUIREMENTS. IT IS EMPHASIZED THAT ALTHOUGH SPECIAL EFFORT IS MADE TO REDUCE THE POTENTIAL CAUSES AND NUMBER OF SUCH CRACKS, IT IS NOT PRACTICAL TO PROVIDE TOTAL ARTICULATION BETWEEN THE FLOOR SYSTEM AND ITS SUPPORTS AND THEREBY ACHIEVE COMPLETE INHIBITION OF ALL CRACKS.
3. MOST SUCH CRACKS DEVELOP OVER THE FIRST THREE YEARS OF THE LIFE OF THE FLOOR SYSTEM. CRACKS WHICH ARE WIDER THAN 0.01 INCH MAY NEED TO BE PRESSURE EPOXIED.
4. THE OBJECT OF THE JOINTS PROVIDED IS TO ALLOW MOVEMENT. MOVEMENTS DUE TO CREEP AND SHRINKAGE MAY BE NOTICEABLE AT JOINTS UP TO TWO YEARS AFTER CONSTRUCTION, BEYOND WHICH MOVEMENTS DUE TO VARIATIONS IN TEMPERATURE WILL PERSIST.

REINFORCING STEEL

1. BAR REINFORCEMENT SHALL CONFORM TO THE FOLLOWING GRADES OF ASTM A615, INCLUDING SUPPLEMENT S1. GRADE 40 - #3 AND SMALLER, GRADE 60 - #4 AND LARGER
2. DETAILS OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH CHAPTER 25 OF THE AMERICAN CONCRETE INSTITUTE (ACI) 318, UNLESS OTHERWISE NOTED.
3. VERTICAL REINFORCEMENT SHALL BE TIED AND FIXED IN POSITION AT THE TOP AND BOTTOM AND AT INTERMEDIATE LOCATIONS, SPACED NOT GREATER THAN 48 INCHES O.C.
4. WELDED STEEL WIRE FABRIC REINFORCEMENT SHALL CONFORM TO ASTM A185
5. LAPS OF WELDED STEEL WIRE FABRIC AT SPLICES SHALL BE NOT LESS THAN 12 INCHES.
6. WALLS, PILASTERS, COLUMNS SHALL BE DOWELED TO THE SUPPORTING FOOTINGS WITH REINFORCEMENT OF THE SAME SIZE, GRADE AND AT THE SAME SPACING AS THE VERTICAL REINFORCEMENT IN THE WALLS, PILASTERS, OR COLUMNS.
7. BAR SUPPORTS SHALL BE PROVIDED IN ACCORDANCE WITH THE PROVISIONS OF "BAR SUPPORT SPECIFICATIONS" AS CONTAINED IN THE LATEST EDITION OF THE "MANUAL OF STANDARD PRACTICE" BY THE CONCRETE REINFORCING STEEL INSTITUTE (CRSI), EXCEPT AT SLABS; THE REINFORCING SHALL BE SUPPORTED BY CHAIRS SPACED AT 36 INCHES O.C. FOR #3 REBARS AND 48 INCHES ON CENTER FOR LARGER REBARS. CHAIRS FOR SLAB ON GRADE SHALL BE CONCRETE BLOCKS.
8. REINFORCING STEEL DETAILING, BENDING AND PLACING SHALL BE IN ACCORDANCE WITH THE CONCRETE REINFORCING STEEL INSTITUTE "MANUAL OF STANDARD PRACTICE", LATEST EDITION.
9. ALL REINFORCEMENT SHALL BE SECURELY TIED IN PLACE BEFORE PLACING CONCRETE OR GROUT.
10. PROVIDE CORNER BARS TOP AND BOTTOM AT ALL BEAM CORNERS AND DEAD END BEAM INTERSECTIONS. BARS TO EQUAL SIZE AND QUANTITY OF THE NOTED BEAM STEEL. BARS SHALL LAP BEAM REINFORCEMENTS.
11. BARS DETAILED AS CONTINUOUS SHALL BE LAPPED AT SPLICES.
12. EXTEND THE SLAB REINFORCING STEEL, PERPENDICULAR TO BEAM, TO THE TOP OUTSIDE REINFORCING BAR OF PERIMETER BEAMS. START THE SLAB REINFORCING STEEL, PARALLEL TO BEAM, NOT MORE THAN 3" FROM THE TOP INSIDE REINFORCING BAR OF PERIMETER BEAMS.
13. PROVIDE #4 "Z" BARS AT 12" ON CENTER WHERE THE SLAB STEPS DOWN MORE THAN 2". THE "Z" BARS SHALL LAP THE MAIN SLAB REINFORCING STEEL.
14. ALL CONDUIT OR PLUMBING LINES IN SLAB SHALL BE PLACED BELOW SLAB THICKNESS AREA. ALL CONDUIT NO GREATER THAN 1" DIAMETER MAY BE PLACED IN CENTER OF SLAB. NO CONDUITS OR PLUMBING LINES GREATER THAN 1 INCH ALLOWED IN THE SLAB THICKNESS AREA.
15. WELDING OF CROSSING BARS AND TACK WELDING OF REINFORCEMENT SHALL NOT BE PERMITTED.
16. WELDING OF REINFORCING STEEL IS NOT PERMITTED.
17. CONTRACTOR SHALL SUBMIT REINFORCING STEEL SHOP DRAWINGS FOR REVIEW BEFORE FABRICATION AND INSTALLATION.
18. LAPS AT BAR SPLICES, UNLESS NOTED OTHERWISE, SHALL BE AS FOLLOWS:
    MASONRY - GRADE 60: LAP 50 DIA. (30" MIN.)
    GRADE 40: LAP 48 DIA. (24" MIN.)
    CONCRETE - LAP PER SCHEDULE BELOW

BAR SPLICE LAP LENGTH IN CONCRETE

BAR SIZE	f'c = 2000 PSI	f'c = 3000 PSI	f'c = 4000 PSI	f'c = 5000 PSI
#3	22	22	22	22
#4	29	29	29	29
#5	40	40	40	40
#6	57	57	57	57
#7	77	63	54	54
#8	100	82	71	71

FOR WELDED WIRE FABRIC: SPACING OF WIRE PLUS 12".

19. CONCRETE COVER FOR REINFORCING AS FOLLOWS:

EXPOSURE CONDITION	MINIMUM COVER	TOLERANCE
DRILLED PIERS, FOOTINGS AND OTHER PRINCIPAL STRUCTURAL MEMBERS IN WHICH CONCRETE IS DEPOSITED AGAINST GROUND:	3"	3/8"
WHERE CONCRETE SURFACES, AFTER REMOVAL OF FORMS, ARE EXPOSED TO WEATHER OR GROUND:		
FOR BARS GREATER THAN 5/8" IN DIAMETER	3"	1/4"
FOR BARS 5/8" OR LESS IN DIAMETER	3"	1/4"
WHERE SURFACES ARE NOT DIRECTLY EXPOSED TO WEATHER OR GROUND:		
FOR SLAB ON GRADE (FROM TOP OF SLAB)	1 1/2"	1/4"
FOR BEAMS, COLUMNS	2"	1/4"
FOR JOISTS AND SLABS	2 1/2"	1/8"

SHOP DRAWINGS AND SUBMITTALS

1. SHOP DRAWINGS SHALL BE PREPARED AND SUBMITTED FOR REVIEW TO THE STRUCTURAL ENGINEER FOR EACH STRUCTURAL BUILDING MATERIAL AS INDICATED IN THE STRUCTURAL GENERAL NOTES AND THE CONTRACT SPECIFICATIONS. SEE THE CONTRACT SPECIFICATIONS FOR SUBMITTAL PROCEDURES AND ADDITIONAL INFORMATION
2. SHOP DRAWINGS SHALL USE DRAFTING LINE WORK AND LETTERING THAT IS CLEARLY LEGIBLE. SHOP DRAWINGS SHALL NOT CONTAIN NO REPRODUCTIONS OF THE CONTRACT DRAWING PLANS OR DETAILS.
3. SUBMIT ONE REPRODUCIBLE VELLUM AND ONE COPY OF EACH SHOP DRAWING.
4. SHOP DRAWINGS SHALL NOT SHOW MATERIALS FOR MORE THAN ONE LEVEL OF THE SAME PLAN.
5. SHOP DRAWINGS SHALL SHOW CLEAR AND COMPLETE INFORMATION FOR THE FABRICATION (DETAIL SHEETS AND/OR MATERIAL LISTS) AND INSTALLATION.
6. ALLOW A MINIMUM OF (2) WEEKS FOR REVIEW OF EACH SET OF SHOP DRAWINGS.
7. CONTRACTOR SHALL REVIEW THE SHOP DRAWINGS SUBMITTED BY THE SUB-CONTRACTOR AND COORDINATE SHOP DRAWINGS WITH ALL OTHER TRADING PRIOR TO SUBMITTING THEM FOR ENGINEER REVIEW.
8. CONTRACTOR SHALL ANSWER ALL QUESTIONS OR CLARIFICATIONS BY THE SUB-CONTRACTOR BEFORE SUBMITTING TO ENGINEER FOR REVIEW. ANY QUESTIONS THAT THE CONTRACTOR CANNOT ANSWER WITH THE INFORMATION ON THE DRAWINGS SHALL CLEARLY BE MARKED FOR THE ENGINEER FOR REVIEW.
9. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL DIMENSIONS, SEE NOTE NUMBER 3 UNDER GENERAL NOTES.
10. REVIEW OF SHOP DRAWINGS BY THE ENGINEER IS FOR GENERAL CONFORMANCE TO THE STRUCTURAL DRAWINGS. APPROVAL OF THE SHOP DRAWINGS BY THE ENGINEER DOES NOT RELIEF THE CONTRACTOR FOR ANY ERRORS IN DIMENSIONS OR MATERIALS INDICATED ON THE SHOP DRAWINGS.
11. IF THERE IS ANY DISCREPANCY BETWEEN THE STRUCTURAL DRAWINGS AND SHOP DRAWINGS, THE INFORMATION SHOWN ON THE STRUCTURAL DRAWINGS GOVERN. INFORMATION THAT IS NOT INDICATED ON THE SHOP DRAWINGS SHALL BE OBTAINED FROM THE STRUCTURAL DRAWINGS.
12. PROVIDE SUBMITTALS FOR THE FOLLOWING ITEMS:

ITEM	REQUIRED
A. CONCRETE MIX DESIGN	X
B. CURING COMPOUND FOR CONCRETE	X
C. REINFORCING STEEL	X
D. STRUCTURAL STEEL	X
E. STEEL JOIST	N.A.
F. METAL DECKING (INDICATE LAYOUT AND TYPES OF DECK PANELS, ANCHORAGE DETAILS, REINFORCING CHANNELS, PANS, DECK OPENINGS, SPECIAL JOINTING, ACCESSORIES, AND ATTACHMENTS TO OTHER CONSTRUCTION.)	N.A.
G. MORTAR MIX DESIGN	X
H. GROUT MIX DESIGN	X
I. MASONRY ASSEMBLAGE	X
J. LIGHT WEIGHT COLD-FORMED STEEL (INCLUDE CALC'S & REACTIONS)	N.A.
K. PRE-MANUFACTURED METAL BUILDING (INCLUDE CALC'S & REACTIONS)	N.A.
L. PRE-MANUFACTURED WOOD TRUSSES (INCLUDE CALC'S & REACTIONS)	X

STRUCTURAL STEEL

1. MATERIAL AND WORKMANSHIP SHALL CONFORM TO THE LATEST EDITION OF THE AISC SPECIFICATIONS FOR THE DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS.
2. STRUCTURAL STEEL SHALL COMPLY WITH THE FOLLOWING ASTM DESIGNATIONS:

MATERIAL	DESIGNATION	STRENGTH
ANCHOR RODS	F1554	Fy=36 ksi
PLATES	A36	Fy=36 ksi
ANGLES	A36	Fy=36 ksi
CHANNELS	A36	Fy=36 ksi
WIDE FLANGE SHAPES	A992	Fy=50 ksi
STEEL PIPE	A53 GRADE B	Fy=35 ksi
SQUARE & RECT. STEEL TUBES (HSS)	A500 GRADE B	Fy=46 ksi
ROUND TUBES (HSS)	500 GRADE B	Fy=42 ksi

3. ALL STRUCTURAL STEEL SHALL BE FABRICATED, ERECTED, AND PAINTED IN ACCORDANCE WITH THE SPECIFICATIONS FOR THE DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS AS AMENDED TO DATE AND THE CODE OF STANDARD PRACTICE, LATEST EDITION AS ADOPTED BY THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION.
4. WELDING SHALL BE DONE IN ACCORDANCE WITH THE STANDARD CODE FOR ARC AND GAS WELDING IN BUILDING CONSTRUCTION AS PUBLISHED BY THE AMERICAN WELDING SOCIETY, EXCEPT THAT ALL WELDING SHALL BE DONE BY THE ELECTRIC ARC PROCESS. ALL WELDING SHALL BE PERFORMED BY CERTIFIED WELDERS AND SHALL CONFORM TO ANSI/AWS D1.1-04
5. CONNECTION DESIGN: DELEGATED DESIGN
   - A. ALL DETAILED AND/OR SCHEDULED CONNECTIONS ARE TO BE CONSIDERED CONCEPTUAL AND SHALL BE DESIGNED BY THE STEEL FABRICATOR WITH SIGNED AND SEALED CALCULATIONS BY A TEXAS LICENSED PROFESSIONAL ENGINEER.
   - B. ANY CONNECTIONS NOT DETAILED OR SCHEDULED OR ALTERED FOR FABRICATION PURPOSES SHALL BE DESIGNED AND DETAILED BY THE FABRICATOR AND SHALL BE MARKED FOR THE ENGINEER'S VERIFICATION.
   - C. CONNECTIONS SHALL BE DESIGNED ACCORDING TO THE REACTIONS INDICATED ON THE STRUCTURAL DRAWINGS. ALL REACTIONS SHOWN ARE BASED ON SERVICE LOADS AND ARE INTENDED FOR USE WITH THE ALLOWABLE STRENGTH DESIGN (ASD) METHOD UNLESS NOTED OTHERWISE. IF NO REACTIONS SHOWN, DESIGN BEAM CONNECTIONS TO SUPPORT AT LEAST 50% OF THE MAXIMUM TOTAL UNIFORM LOAD CAPACITY SHOWN IN TABLE 3-6 OF THE AISC MANUAL.
   - D. THE CONCEPTUAL CONNECTION DETAILS SHOWN INDICATE THE CONNECTION TYPE REQUIRED AND MAY NOT FULLY REFLECT THE FINAL COMPLEXITY OR SCOPE OF THE CONNECTION.
   - E. ADDITIONAL CONNECTION ELEMENTS MAY BE REQUIRED IN THE FINAL DESIGN SUCH AS: STIFFENER PLATES, DOUBLER PLATES, SHIMS, AND/OR OTHER CONNECTION MATERIAL.
   - F. ALL CONNECTION PLATES AND STIFFENERS SHALL BE MADE WITH 1/4" THICK PLATES, UNLESS OTHERWISE NOTED ON PLANS.
6. SEE ARCHITECTURAL PLANS FOR MISCELLANEOUS STEEL ITEMS NOT INDICATED ON STRUCTURAL DRAWINGS. STEEL ITEMS SHOWN ON ARCHITECTURAL DRAWINGS AND NOT SPECIFIED ON THE STRUCTURAL DRAWINGS SHALL BE DESIGN BY THE STEEL FABRICATOR. SEE DESIGN CRITERIA FOR LOADING.
7. ALL WELDED CONNECTIONS SHALL BE MADE USING 1/4" FILLET WELD, U.N.O.
8. ALL BOLTED CONNECTIONS SHALL BE MADE USING 3/4" DIAMETER HIGH STRENGTH BOLTS, ASTM A325, BEARING TYPE CONNECTION w/ WASHERS ASTM F436, U.N.O. ON DESIGN DRAWINGS. SPECIAL INSPECTION REQUIRED FOR ALL HIGH STRENGTH BOLTING. ALL NUTS SHALL BE PER ASTM A563
9. ALL CONNECTION PLATES AND STIFFENERS SHALL BE MADE WITH 1/4" THICK PLATES, UNLESS OTHERWISE NOTED ON PLANS.
10. ALL STEEL (INCLUDING BOLTS) EXPOSED TO THE WEATHER SHALL BE HOT DIPPED GALVANIZED. (INCLUDES STEEL THAT IS ONLY COVERED WITH PLASTER OR STUCCO). SEE ARCHITECTURAL PLANS IF STRICTER REQUIREMENTS ARE REQUIRED.
11. ALL EXPOSED STEEL SHALL FOLLOW SECTION 10 OF THE CODE OF STANDARD PRACTICE OF AISC SECTION 10 OF THE CODE ADDRESSES ARCHITECTURALLY EXPOSED STRUCTURAL STEEL (AESS)
12. CONNECTIONS SHALL BE PER HOLLOW STRUCTURAL SECTIONS, CONNECTION MANUAL BY AISC
13. WHERE STEEL MEMBER PASS THROUGH CMU WALLS, PROVIDE HALF INCH GAP BETWEEN THE CMU AND THE STEEL MEMBER. PROVIDE ELASTOMERIC MATERIAL BETWEEN THE THE STEEL MEMBER AND CMU WALL. PROVIDE FIRE PROOF ELASTORMERIC MATERIAL WHERE REQUIRED.
14. ALL BEAMS NOT SHOWN SHALL BE W18x35. ALL COLUMNS NOT SHOWN SHALL BE HSS 6x6x5/16.
15. STEEL FABRICATOR SHOP SHALL BE AISC CERTIFIED.
16. HOLES FOR BOLTS IN STRUCTURAL STEEL SHALL BE DRILLED OR PUNCHED. BURNING OF HOLES SHALL NOT BE PERMITTED. UNLESS NOTED OTHERWISE, HOLES SHALL BE STANDARD SIZE 1/16 INCH LARGER THAN THE BOLT, UNLESS NOTED OTHERWISE.
17. ALL STRUCTURAL STEEL SHAPES SHALL BE PRIMED WITH A RUST RESISTANT PRIMER BEFORE SHIPMENT TO THE PROJECT SITE. PRIMER SHALL NOT BE APPLIED TO THE IMMEDIATE AREA OF STEEL INTENDED TO RECEIVE SLIP CRITICAL BOLTED CONNECTIONS
18. HIGH STRENGTH BOLTS INSTALLATION SHALL BE CONTINUOUSLY INSPECTED BY A SPECIAL INSPECTOR. FOLLOWING ARE REQUIREMENTS OF THE SPECIAL INSPECTOR:
    - A. THE INSPECTOR SHALL VERIFY THE MILL CERTIFICATES FOR MATERIAL.
    - B. THE INSPECTOR SHALL VERIFY THAT THE MATERIAL USED ARE PROPERLY STORED AND PREPARED FOR USE.
    - C. THE INSPECTOR SHALL VERIFY THAT CONSTRUCTION DETAILS, PROCEDURES, TOOL CALIBRATIONS, WORKMANSHIP ARE IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS AND BUILDING CODE.
    - D. FOR SNUG-TIGHT CONNECTIONS, THE INSPECTOR SHALL VERIFY THAT THE PLIES OF THE CONNECTED ELEMENTS HAVE BEEN BROUGHT INTO SNUG CONTACT WITH EACH OTHER.
    - E. FOR SLIP-TIGHT CONNECTIONS, THE INSPECTOR SHALL VERIFY THE PRETENSION METHOD SELECTED BY THE CONTRACTOR HAS INDUCED THE REQUIRED MINIMUM TENSION IN THE BOLT IN ACCORDANCE TO THE AISC SPECIFICATION TABLE J3.1.
    - F. A CERTIFICATE OF INSPECTION SHALL BE FURNISHED BY THE SPECIAL INSPECTOR TO THE BUILDING OFFICIAL PRIOR TO SCHEDULED INSPECTION AND TO THE ARCHITECT AND ENGINEER.
19. WELDING IN THE FIELD SHALL BE CONTINUOUSLY INSPECTED, BY A SPECIAL INSPECTOR FOLLOWING ARE REQUIREMENTS OF THE SPECIAL INSPECTOR:
    - A. THE INSPECTOR SHALL VERIFY THAT THE MATERIAL USED ARE PROPERLY STORED AND PREPARED FOR USE.
    - B. THE INSPECTOR SHALL VERIFY THE WELDER'S QUALIFICATIONS.
    - C. THE INSPECTOR SHALL VERIFY THAT CONSTRUCTION DETAILS, PROCEDURES AND WORKMANSHIP ARE IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS AND BUILDING CODE.
    - D. A CERTIFICATE OF INSPECTION SHALL BE FURNISHED BY THE SPECIAL INSPECTOR TO THE BUILDING OFFICIAL PRIOR TO SCHEDULED INSPECTION AND TO THE ARCHITECT AND ENGINEER.
20. ALL NON SHRINK GROUT FOR LEVELING OF BASE PLATES SHALL HAVE A MINIMUM 5000 PSI COMPRESSIVE STRENGTH AT 28 DAYS. GROUT SHALL COMPLY WITH CORPS OF ENGINEERS SPECIFICATION CRD-C 621.

DRILLED-AND-UNDERREIMED PIERS

1. CONCRETE PIERS SHALL BE PER SCHEDULE OR DETAIL. THE ACTUAL ELEVATION SHALL BE DETERMINED IN THE FIELD BY A GEOTECHNICAL ENGINEER LICENSED IN THE STATE OF TEXAS WITH EXPERIENCE IN THIS AREA.
2. ALL REINFORCING BARS SHALL BE NEW BILLET STEEL AND SHALL CONFORM TO ASTM A-615, GRADE 60.
3. ALL REINFORCING STEEL SHALL BE CONTINUOUS WITH SPLICES LAPPED 75 BAR DIAMETERS.
4. CENTER PIER UNDER COLUMN OR WALL UNLESS DIMENSIONED OTHERWISE.
5. PIERS SHAFT SHALL BE DRILLED PLUMB ALONG ITS TOTAL LENGTH (1" PER 10'-0" MAXIMUM TOLERANCE)
6. UNDERREAM THE FOOTING BELL TO THE DIMENSION AND DEPTH AS SHOWN OR APPROVED BY GEOTECHNICAL ENGINEER.
7. BOTTOM OF REAM TO BE CLEAN AND FREE OF ALL LOOSE MATERIALS AND WATER.
8. CENTER STEEL CAGE IN SHAFT WITH A MINIMUM 3 LEVELS OF CONCRETE BLOCK SPACERS (8 FT. MAXIMUM SPACING) AT A MINIMUM OF 3 EVENLY ON 3" CONCRETE SEAT BLOCK.
9. DO NOT RAISE CAGE OFF OF FOOTING BOTTOM DURING CONCRETE PLACEMENT.
10. CONCRETE AND REINFORCING IN SHAFTS SHALL BE PLACED THE SAME DAY AS DRILLING.
11. PIERS SHALL BE FOUNDED IN UNDISTURBED NATURAL SOIL.
12. CONTRACTOR SHALL COORDINATE WITH GEOTECHNICAL ENGINEER FOR VERIFICATION OF PIERS BEARING STRATUM AT TIME OF DRILLING.
13. WIDEN AND DEEPEN GRADE BEAMS ALL AROUND PIER LOCATIONS TO ASSURE CONCRETE COVERAGE.
14. PROVIDE INSPECTING ENGINEER WITH AN ELECTRIC LIGHT AND PLUMB-BOB TO OBSERVE ALL DRILLED PIERS.
14. ALL DRILLED FOOTINGS SHALL BE FREE OF WATER PRIOR TO PLACING OF CONCRETE.
16. PIER HOLES SHALL NOT BE LEFT OPEN OVERNIGHT (NO EXCEPTIONS).
17. PROVIDE STEEL CASING AS NOTED ON THE TYPICAL FOOTING DETAIL, AS REQUIRED TO PREVENT CAVE-IN AND SEAL OFF SUBSURFACE WATER.
18. STEEL CASING SHALL BE REMOVED DURING POURING SEQUENCE.
19. CONTRACTOR SHALL INCLUDE IN BID DOCUMENTS THE COSTS FOR CASING IF REQUIRED (TO BE DETERMINED ON JOB SITE BY GEOTECHNICAL ENGINEER) AND UNIT COSTS FOR GREATER AND LESSER DEPTH OF DRILLING.
20. REFER TO GEOTECHNICAL INVESTIGATION REPORT FOR CONCRETE PLACEMENT FOR THE PIER.
21. SEE GEOTECHNICAL INVESTIGATION REPORT FOR ADDITIONAL INFORMATION
22. CONCRETE SHALL BE PLACED THROUGH A SUITABLE TUBE OR TREMIE TO PREVENT SEGREGATION OF MATERIALS.

PRE-MANUFACTURED WOOD TRUSSES

1. THE TRUSS MANUFACTURER SHALL CALCULATE ALL LOADS, INCLUDING BUT NOT LIMITED TO UNIFORM LOADS, LATERAL LOADS, AND ANY LOADS DUE TO MECHANICAL EQUIPMENT, ETC. TO DETERMINE THE SUITABILITY OF THEIR TRUSS FOR THE PROPOSE INTENDED USE AS SOME HEREIN. THE TRUSS MANUFACTURER IS RESPONSIBLE FOR DOING ALL ENGINEERING FOR THEIR TRUSSES AND SHALL NOTIFY THE ENGINEER IMMEDIATELY OF ANY ADVERSE CONDITIONS THAT MAY ARISE. CALCULATIONS SHALL INDICATE ACTUAL DESIGN STRESSES AND DEFLECTIONS COMPARED TO THE ALLOWABLE STRESSES AND DEFLECTIONS.
2. STRUCTURAL DESIGN, DIMENSIONS, TRUSS CONFIGURATION AND QUANTITY IS THE RESPONSIBILITY OF THE PRE-MANUFACTURED TRUSS SUPPLIER. VERIFY PLAN DIMENSIONS AND ROOF PITCHES WITH ARCHITECTURAL PLANS.
3 TRUSS ELEVATIONS ARE SHOWN FOR FRAMING INTENT TO TRANSFER TRUSS LOADS TO BEARING POINTS ONLY.
4. DESIGN OF PLATE CONNECTED TRUSSES SHALL CONFORM TO NATIONAL DESIGN STANDARDS (LATEST EDITION), TRUSS PLATE INSTITUTE CRITERIA (LATEST EDITION). STEEL GUSSET PLATES SHALL BE MINIMUM 20 GAGE, ASTM A-446 GRADE A, APPROVED BY ICBO.
   MINIMUM PROPERTIES: CHORD LUMBER
   FB = 2,150 PSI
   E = 1,900,000 PSI
   MAXIMUM MOISTURE CONTENT 15% AT TIME OF FABRICATION
   MINIMUM PROPERTIES: WEB LUMBER
   FB = 1,500 PSI
   E = 1,600,000 PSI
   MAXIMUM MOISTURE CONTENT 19% AT TIME OF FABRICATION
5. TRUSS DESIGNS AND LAYOUTS SHALL BE SEALED BY A TEXAS LICENSED PROFESSIONAL ENGINEER AND SUBMITTED TO ARCHITECT AND ENGINEER FOR REVIEW PRIOR TO FABRICATION.
6. TRUSS FABRICATION SHALL COMPLY WITH THE LATEST TPI QUALITY CONTROL STANDARDS. TRUSS PLANT SHALL BE INSPECTED BY THIRD PARTY CERTIFIED AGENCY.
7. TRUSSES SHALL BE ERECTED, BRACED, AND BLOCKED IN ACCORDANCE WITH BRACING WOOD TRUSSES (BWT-LATEST EDITION) BY TPI, AND THE RECOMMENDATIONS OF THE TRUSS MANUFACTURER.
8. ALL TRUSSES EXCEPT SCISSORS TO BE CONNECTED TO BEARING PLATE WITH TYPE H5 TRUSS CLIP AS MANUFACTURED BY "SIMPSON STRONG-TIE" OR A REVIEWED EQUIVALENT. U.N.O.
9. SCISSORS TRUSSES SHALL BE CONNECTED TO BEARING PLATE WITHTYPE TC TRUSS CLIP AS MANUFACTURED BY "SIMPSON STRONG-TIE" OR A REVIEWED EQUIVALENT.
10. REFER TO STRUCTURAL ROOF FRAMING PLANS FOR CONCENTRATED LOADS APPLIED TO TRUSSES.
11. IF TRUSS BEARING CONDITIONS VARY FROM THOSE INDICATED, NOTIFY STRUCTURAL ENGINEER PRIOR TO CONSTRUCTION OF THE FOUNDATION SO ANY REVISIONS TO THE DESIGNED FOUNDATION MAY BE MADE.
12. TRUSS MANUFACTURER SHALL SUPPLY THE TYPE OF CONNECTION BETWEEN HIP TRUSSES TO GIRDER TRUSSES, AND JACK TRUSSES TO HIP TRUSSES MINIMUM CONNECTION HARDWARE SHALL BE A "LUS" HANGER AND SKEWED "U" HANGER AS REQUIRED.
13. EACH TRUSS SHALL BE LEGIBLY BRANDED, MARKED, OR OTHERWISE HAVE PERMANENTLY AFFIX THERETO THE FOLLOWING INFORMATION LOCATED WITHIN 2 FEET OF THE CENTER OF THE SPAN ON THE FACE OF THE BOTTOM CHORD:
    - A. IDENTITY OF THE COMPANY MANUFACTURING THE TRUSS.
    - B. THE DESIGN LOAD.
    - C. THE SPACING OF THE TRUSSES.

SHEATHING

1. SHEATHING FOR ROOF TO BE TYPE CDX EXT., STRUCTURAL I -APA RATED, 5/8" THICK, (32/16).
2. PLACE ROOF SHEATHING WITH END JOINTS STAGGERED. SECURE SHEETS OVER FIRM BEARING WITH 10D COMMON NAILS AT 6" O.C. AT PANEL EDGES, AT 12" O.C. AT INTERMEDIATE SUPPORTS. ALL SHEATHING TO BE PLACED PERPENDICULAR TO FRAMING MEMBERS.
3. SHEATHING WHICH RECEIVES LIGHTWEIGHT INSULATING CONCRETE TO BE COVERED WITH 4 MIL. POLYETHYLENE FILM.
4. NO A/C UNITS SHALL BE PLACED ON ROOF AREA.
5. LEAVE 1/8" SPACE AT ALL PANEL EDGE JOINTS AND END JOINTS UNLESS OTHERWISE RECOMMENDED BY MANUFACTURER.

WOOD FRAMING NOTES

1. ALL FRAMING LUMBER SHALL BE NO.2 SOUTHERN PINE OR BETTER.
2. PROVIDE SOLID BLOCKING BETWEEN ROOF RAFTERS, CEILING JOISTS AND FLOOR JOIST AT BEARING LOCATIONS AND AT MID SPAN OF SPANS GREATER THAN 8'-0" OR AS NOTED. SIZE SHALL MATCH FRAMING MEMBER.
3. NOT USED.
4. WHERE JOISTS, RAFTERS, OR BEAMS FRAME TOGETHER OR TO EACH OTHER AT THE SAME ELEVATION, PROVIDE FACE NAIL HANGER OR TOP FLANGE HANGERS.
5. CONNECT ROOF RAFTERS TO BEARING PLATES WITH TYPE H2.5A ANCHORS.
6. MULTI-MEMBER BEAMS SHALL BE ATTACHED TOGETHER BY GLUING AND NAILING WITH 10D NAILS AT 6" O.C. STAGGERED TOP AND BOTTOM.
7. FLITCH BEAMS SHALL BE ATTACHED TOGETHER USING 1/2" DIAMETER THRU BOLTS AT 12" O.C. STAGGERED TOP AND BOTTOM. PROVIDE STANDARD FLAT WASHER EACH SIDE OF BEAM. BOLT HEADS AND NUTS MAY BE COUNTERSUNK WHERE REQUIRED FOR FINISH OUT. (MAX. 1/2").
8. SIMPLE SPAN WOOD MEMBERS, NOT SHOP CHAMBERED, SHALL BE ERECTED WITH THE NATURAL CAMBER UP. FOR CANTILEVERED WOOD MEMBERS, CONSULT WITH ENGINEER.
9. PROVIDE DOUBLE STUD TO SUPPORT ALL BEAMS, GIRDERS, AND HIP TRUSSES UNLESS POSTS ARE SPECIFIED.
10. LAP FRAMING MEMBERS WHICH BEAR ON 2x STUDS OR PLATES TO PROVIDE FULL BEARING FOR EACH MEMBER.
11. ALL EXTERIOR STUD WALLS SHALL BE 2x6 AT 16" O.C. AND INTERIOR LOAD BEARING STUD WALLS TO BE 2x4 AT 16 O.C. PROVIDE WIND BRACING AS SHOWN ON PLANS. REFER TO ARCHITECTURAL PLANS FOR NON-LOAD BEARING STUD WALLS.
12. ALL STUD WALLS TO BE CONNECTED TO FOUNDATION WITH 5/8" DIAMETER x 1'-0" (AT LEAST 8" INTO CONCRETE) "J" BOLTS SPACED AT 32" O.C. MAXIMUM. PROVIDE TWO AT EACH CORNER.
13. ALL HEADERS TO BE (2) 2X8 MINIMUM UNLESS NOTED OTHERWISE OR ON SCHEDULE OR PLANS.
14. DIAPHRAGM NAILING SHALL CONFORM TO SECTION 2306 OF IBC 2012 WITH NOMENCLATURE DEFINED AS FOLLOWS:
    BN = NAILING AT DIAPHRAGM BOUNDARIES, CONTINUOUS PANEL EDGES, AND AT EDGES OF OPENING.
    EN = EDGE NAILING
    FN = FIELD NAILING
15. MINIMUM NAILING OF WOOD SHALL BE PER TABLE 2304.9.1 OF THE IBC UNLESS NOTED OTHERWISE ON DRAWINGS.
16. EACH ANCHOR BOLT SHALL HAVE A MINIMUM 0.25 INCH BY 3 INCHES BY 3 INCHES STEEL PLATE WASHER BETWEEN THE SILL PLATE AND NUT
17. LUMBER SHALL BE DRY AND WELL SEASONED, AND THE MOISTURE CONTENT SHALL NOT EXCEED 19% AT THE TIME THE STRUCTURE IS WRAPPED. ALL LUMBER SHALL BE AIR-SEASONED NOT LESS THAN 30 DAYS BEFORE BEING COVERED WITH FINISHING MATERIALS UNLESS TESTS ARE MADE OF ITS MOISTURE CONTENT.
18. ALL WOOD RESTING ON CONCRETE OR MASONRY (MUD SILL) SHALL BE PRESERVATIVE TREATED DOUGLAS FIR. ALL WOOD EMBEDDED IN CONCRETE OR IN CONTACT WITH SOIL SHALL BE PRESERVATIVE TREATED DOUGLAS FIR.
19. SOLID FRAMING LUMBER REQUIRED TO BE PRESERVATIVE TREATED SHALL BE PRESSURE TREATED IN ACCORDANCE WITH AMERICAN WOOD PRESERVERS ASSOCIATION. AWPA STANDARD C-2, LUMBER, TIMBERS BRIDGE AND MINE TIES-PRESSURE TREATMENT. PLYWOOD REQUIRED TO BE PRESERVATIVE TREATED SHALL BE PRESSURE TREATED IN ACCORDANCE WITH AMERICAN WOOD PRESERVERS ASSOCIATION, AWPA STANDARD C-9. PLYWOOD-PRESERVATIVE TREATMENT. TREATMENT SHALL APPROPRIATE FOR THE LOCATION OF THE WOOD BEING EITHER ABOVE GROUND OR GROUND CONTACT. TREATMENT SHALL BE WITH AMMONIACAL COPPER ZINC ARSENATE (CHEMONITE). A GRADE MARK INDICATING CONFORMANCE TO THE TREATING STANDARD, AND THE TYPE OF TREATMENT SHALL BE AFFIXED TO THE MATERIAL. THE INSPECTION AGENCY SHALL BE INDEPENDENT OF THE STREATING PLANT. THE INSPECTION AGENCY SHALL BE UNDER THE SUPERVISION OF THE AMERICAN WOOD PRESERVERS BUREAU INSPECTION SHALL BE IN ACCORDANCE WITH AWPB LP, STANDARD. AFTER INSTALLATION, EXPOSED SURFACES SHALL BE PROTECTED WITH A MINIMUM OF TWO COATS OF SEALER. INTERIOR SURFACES SHALL BE COVERED BY FRAMING OR DRYWALL.
20. SHEAR TRANSFER:
    ROOF TO WALL: CONNECT ROOF TRUSSES TO TOP PLATE w/ SIMPSON TC 26 OR PER SHEAR TRANSFER DETAILS. FLOOR TO WALL: CONNECT JOIST RIM OR JOIST TO WALL PLATE w/ 16d AT 12" O.C., OR SOLID BLOCKING OR RIM TO WALL PLATE w/ A35 A35F, OR LPT4 AT 24" O.C. OR PER SHEAR TRANSFER DETAILS.
21. SILL PLATE ANCHORS:
    UPPER FLOOR WALLS: 16d AT 6" O.C. TO JOIST OR 2x SOLID BLOCKING, AT SHEARWALLS, NAIL PER SCHEDULE INTO JOIST, RIM, 2x EDGE, OR 2x FLAT TO ACHIEVE REQUIRED SPACING, SEE DETAILS.
    FIRST STORY WALLS: .145 DIA.x2 7/8" HILTI SDM OR X-ZF LOW VELOCITY DRIVE FASTENERS AT 16" O.C. EXTERIOR, OR 32" O.C. INTERIOR, INSTALLED PER ICBO EVALUATION REPORT 2388 5/8" DIA. x 12" ANCHOR BOLTS AT 4'-0" O.C. AND NOT MORE THAN 9" FROM ENDS.
22. WHERE THE DIAPHRAGM BLOCKING IS SPECIFIED, USE 2x4 BLOCKING (WITH "Z" CLIPS). U.O.N.
23. PROVIDE DOUBLE STUD TO SUPPORT ALL BEAMS, GIRDERS, AND HIP TRUSSES UNLESS POSTS ARE SPECIFIED.
24. PROVIDE DOUBLE BLOCKING UNDER ALL POSTS.
25. TOP PLATES OF ALL WOOD STUD WALLS SHALL BE (2) 2x (SAME WIDTH AS STUDS), LAP 48" (MIN.), WITH AT LEAST (16) 16d NAILS AT EACH SIDE OF LAP AND NOT MORE THAN 12" BETWEEN, U.N.O.
26. PROVIDE 2x4 TRIM AND 2x4 KING STUD EACH END OF EACH 4x DROPPED BEAM OR HEADER.
27. PROVIDE 2x6 TRIM AND 2x6 KING STUD EACH END OF EACH 6x DROPPED BEAM OR HEADER.
28. PROVIDE MINIMUM 2 1/4" BEARING AT EACH END OF EACH FLUSH BEAM OR HEADER. WHERE BEARING IS ON TOP PLATE PROVIDE 2x4 STUD WITHIN 3" OF BEARING POINT. PROVIDE (3) 2x4 STUDS AT 6x OR LSL OR PSL BEAMS.
29. WHERE JOISTS, RAFTERS, OR BEAMS FRAME TOGETHER OR TO EACH OTHER AT THE SAME ELEVATION, PROVIDE FACE NAIL HANGER OR TOP FLANGE HANGERS.
30. MULTI-MEMBER BEAMS SHALL BE ATTACHED TOGETHER BY GLUEING AND NAILING WITH 10D NAILS AT 6" O.C. STAGGERED TOP AND BOTTOM.

FILE NAME:

DATE: 7/29/19

SURVEYED BY:

DESIGNED BY: IF

DRAWN BY: IF

REVISED BY: IP

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TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP. NORTH PARK SPORT COMPLEX

GENERAL NOTES

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SCALE: FULL: N.T.S. HALF: N.T.S.

TBPE REG. NO. F-13016

STATE OF TEXAS
ISAEL POSADAS
89435
LICENSED PROFESSIONAL ENGINEER

8/15/19.

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY ISAEL POSADAS, P.E. No. 89435 ON AUGUST 15, 2019. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION OF THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

DATE: 8/15/19

SHEET NO.: 34 OF 37

REINFORCED CONCRETE MASONRY UNIT WALLS

1. CONCRETE MASONRY UNITS (CMU) SHALL CONFORM TO ASTM C90, ASTM C426 AND AS FOLLOWS:
   * UNIT COMPRESSIVE STRENGTH: 1900 PSI MINIMUM AVERAGE NET AREA COMPRESSIVE STRENGTH.
   * WEIGHT CLASSIFICATION: MEDIUM WEIGHT
   * CONCRETE MASONRY ASSEMBLAGE (f'm) SHALL BE 1500 PSI.
   * MORTAR SHALL BE TYPE "S".
2. ALL REINFORCING BARS SHALL BE NEW BILLET STEEL AND SHALL CONFORM TO ASTM A-615, GRADE 60, REINFORCING BARS #3 AND SMALLER MAY BE GRADE 40.
3. CONCRETE SHALL CONFORM TO ASTM C150 TYPE I, LOW ALKALI, MASONRY CEMENTS ARE NOT ALLOWED.
4. UNLESS DETAILED OTHERWISE, TYPICAL VERTICAL REINFORCEMENT SHALL BE #6 AT 48" ON CENTER, AND TWO (2) #6 AT JAMBS OF ALL OPENINGS, THREE (3) #6 AT CORNERS, PROVIDE ADDITIONAL VERTICAL REINFORCEMENT FOR SPECIAL CONDITIONS AS DETAILED, ALL VERTICAL REINFORCEMENT TO BE IN CONCRETE OR GROUT FILLED CELLS, PROVIDE DOWELS FROM FOUNDATION, SAME SIZE AND SPACING.
5. VERTICAL CELLS TO BE FILLED SHALL HAVE VERTICAL ALIGNMENT SUFFICIENT TO MAINTAIN A CLEAR, UNOBSTRUCTED CONTINUOUS VERTICAL.
6. ALL REINFORCING SHALL BE IN PLACE PRIOR TO PLACING CONCRETE OR GROUT. VERTICAL REINFORCING BARS SHALL BE HELD IN POSITION AT THE TOP, BOTTOM AND AT INTERVALS NOT FARTHER APART THAN 50 BAR DIAMETERS.
7. TYPICAL HORIZONTAL REINFORCEMENT SHALL BE TWO (2) #5 CONTINUOUS IN 8"x16" DEEP CONTINUOUS CONCRETE FILLED BOND BEAM BELOW EACH FLOOR AND ROOF LEVEL, UNLESS NOTED OTHERWISE. PROVIDE STANDARD DUR-O-WALL TRUSS-TYPE REINFORCING OR PREVIEWED EQUIVALENT EVERY OTHER COURSE (16" ON CENTER) AND AS PRE MANUFACTURER'S RECOMMENDATIONS.
8. WALL LENGTHS LESS THAN OR EQUAL TO FOUR (4) TIMES ITS THICKNESS SHALL BE CONSIDERED COLUMN SECTIONS AND SHALL BE REINFORCED WITH #6 VERTICAL REINFORCING IN FILLED CELLS, PROVIDE 1/4 INCH DIAMETER TIES EVERY COURSE (8" ON CENTER) IN LIEU OF DUR-O-WALL REINFORCING, PLACE TIES NOT LESS THAN 1 1/2" NOR MORE THAN 5" FROM THE SURFACE OF THE COLUMN.
9. PROVIDE HORIZONTAL JOINT REINFORCEMENT EVERY OTHER COURSE WHERE HORIZONTAL BAR REINFORCEMENT IS NOT SPECIFIED.
10. ALL CELLS CONTAINING VERTICAL REINFORCEMENT SHALL BE FILLED SOLIDLY WITH PEA GRAVEL CONCRETE (3/8" MAX. AGGREGATE SIZE) OR GROUT, EACH WITH A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS, GROUT OR CONCRETE SHALL BE A WORKABLE MIX SUITABLE FOR PUMPING WITHOUT SEGREGATION AND SHALL BE THOROUGHLY MIXED, GROUT OR CONCRETE SHALL BE PLACED BY PUMPING OR AN APPROVED ALTERNATE METHOD AND SHALL BE PLACED BEFORE INITIAL SET OR HARDENING OCCURS. GROUTING SHALL BE PER NCMA TEK 3-2.
11. ALLOW C.M.U. WALLS TO SET AT LEAST 24 HOURS AFTER COMPLETION BEFORE GROUTING, GROUT OR CONCRETE SHALL BE CONSOLIDATED BY RECONSOLIDATION AFTER EXCESS MOISTURE HAS BEEN ABSORBED BUT BEFORE WORKABILITY IS LOST, THE FILLING OF ANY SECTION OF A WALL SHALL BE COMPLETED IN ONE DAY WITHOUT INTERRUPTIONS GREATER THAN ONE HOUR, AND PLACED IN LAYERS OF 4 FEET MAXIMUM.
12. WHERE THE CONCRETE OR GROUT POUR EXCEEDS 4 FEET IN HEIGHT, CLEANOUTS SHALL BE PROVIDED BY SUITABLE OPENINGS IN THE FACE SHELLS IN THE BOTTOM COURSE OF EACH CELL TO BE FILLED, OR OTHER APPROVED LOCATIONS, THE CLEANOUTS SHALL BE SEALED AFTER INSPECTION AND BEFORE BEING FILLED.
13. WHEN CELL FILLING IS STOPPED FOR ONE HOUR OR LONGER, HORIZONTAL CONSTRUCTION JOINT SHALL BE FORMED BY STOPPING THE POUR OF CONCRETE OR GROUT APPROXIMATELY 1/2 INCH ABOVE OR BELOW BED JOINT.
14. END WALLS AND CROSS WEBS FORMING CELLS TO BE FILLED SHALL BE FULL BEDDED IN MORTAR TO PREVENT LEAKAGE OF CONCRETE OR GROUT UNLESS WALL IS TO BE POURED SOLID.
15. PROVIDE VERTICAL CONTROL JOINTS AT A MAXIMUM SPACING OF 24' (10' FROM CORNERS.) DO NOT CONTINUE THE TYPICAL TRUSS TYPE JOINT REINFORCEMENT THROUGH THE JOINT. CONTROL JOINTS LOCATIONS SHALL BE COORDINATED WITH ARCHITECT BUT NOT EXCEED THE MAXIMUM SPACING. BOND BEAM REINFORCEMENT SHALL BE INTERRUPTED AT THE CONTROL JOINT, ALTHOUGH CHORD REINFORCING STEEL AT FLOORS & ROOFS MUST CONTINUE THROUGH THE CONTROL JOINTS.
16. DURING ERECTION, COVER TOP OF WALLS, PROJECTIONS AND SILLS WITH WATERPROOF SHEATHING AT THE END OF EACH DAY'S WORK.

STRUCTURAL MASONRY (SPECIAL INSPECTION)

INSPECTION TASK	INSPECTION: CONTINUOUS DURING TASK LISTED	INSPECTION: PERIODICALLY DURING TASK LISTED
1. AS MASONRY CONSTRUCTION BEGINS, THE FOLLOWING SHALL BE VERIFIED TO ENSURE COMPLIANCE:		
A. PROPORTIONS OF SITE PREPARED MORTAR.		X
B. CONSTRUCTION OF MORTAR JOINTS.		X
C. LOCATION OF REINFORCEMENT AND CONNECTORS.		X
2. THE INSPECTION PROGRAM SHALL VERIFY:		
A. SIZE AND LOCATION OF STRUCTURAL ELEMENTS.		X
B. TYPE, SIZE AND LOCATION OF DOWELS, ANCHORS, INCLUDING OTHER DETAILS OF ANCHORAGE OF MASONRY TO OTHER DETAILS OF ANCHORAGE OF MASONRY TO STRUCTURAL MEMBERS, FRAMES AND OTHER CONSTRUCTION		X
C. CHECK GROUT MIX FOR COMPLIANCE WITH CODE AND SPECIFICATIONS.		X
D. WELDING OF REINFORCING BARS.	X	
E. PROTECTION OF MASONRY DURING COLD WEATHER (TEMP. BELOW 40 °F) OR HOT		X
F. WEATHER (TEMP. ABOVE 90 °F). CUTTING OF CLEAN OUT HOLES, KNOCKING DOWN OF FINS AND REMORAL OF DEBRIS.		X
3. PRIOR TO GROUTING, THE FOLLOWING SHALL BE VERIFIED TO ENSURE COMPLIANCE:		
A. GROUT SPACE IS CLEAN.	X	
B. PLACEMENT OF REINFORCEMENT AND CONNECTOR.	X	
C. CHECK GROUT MIX FOR COMPLIANCE WITH CODE AND SPECIFICATIONS.	X	
D. CONSTRUCTION OF MORTAR JOINTS.	X	
E. CHECK INSTALLATION OF CLEAN OUT CLOSURE.	X	
4. GROUT PLACEMENT SHALL BE VERIFIED TO ENSURE COMPLIANCE WITH CODE AND CONSTRUCTION DOCUMENT PROVISIONS. (SUCH AS MECHANICAL VIBRATION DURING PLACEMENT AND LATER DURING RECONSOLIDATION.)	X	
5. PREPARATION OF ANY REQUIRED GROUT SPECIMENS, MORTAR SPECIMENS AND/OR PRISMS SHALL BE OBSERVED.	X	
6. COMPLIANCE WITH REQUIRED INSPECTION PROVISIONS OF THE PROVISIONS OF THE CONSTRUCTON DOCUMENTS AND THE APPROVED SUBMITTALS SHALL BE VERIFIED.		X
7. CHECK THAT CURING REQUIREMENTS ARE BEING FOLLOWED		X
8. VERIFY PLACEMENT OF ANCHORS INTO CONCRETE MASONRY UNITS.	X	
9. FREQUENCY OF TESTS: A. CONCRETE MASONRY UNIT TEST- FOR EACH TYPE, CLASS, AND GRADE OF CONCRETE MASONRY UNIT INDICATED, TEST UNITS BY METHOD OF SAMPLING AND TESTING OF ASTM C140. ONE SET FO CMU STANDARD PRISM TEST SHALL BE CONDUCTED FOR EVERY 5,000 SQ. FT. OF WALL DURING CONSTRUCTION IN ACCORDANCE TO ASTM C1314, BUT NOT LESS THAN ONE SET OF 3 MASONRY PRISMS FOR THE PROJECT. B. MORTAR TEST: FOR EACH TYPE INDICATED, TEST MORTAR BY METHODS OF SAMPLING AND TESTNG OF ASTM C780. CONDUCT TESTS NO LESS FREQUENTLY THAN THAT REQUIRED TO EVALUATE MORTAR USED TO INSTALL EACH INCREMENT OF MASONRY UNITS INDICATED ABOVE FROM WHICH SAMPLES ARE TAKEN FOR TESTING. TEST MORTAR FOR EVERY 1,500 SQ. FT. OF WALL CONSTRUCTION. C. GROUT TEST: AT START OF GROUTNG OPERATION, TAKE ONE TEST PER DAY FOR FIRST 3 DAYS. EACH GROUT TEST CONSISTS OF THREE SPECIMENS MADE IN ACCORDANCE WITH ASTM C1019. AFTER FIRST THREE TESTS, SPECIMENS FOR CONTINUING QUALITY CONTROL SHOULD BE TAKEN ONCE A WEEK FOR EVERY 25 CUBIC YARDS OF GROUT OR FOR EVERY 2,500 SQ. FT. OF WALL, WHICHEVER COMES FIRST.	X	
10. MASONRY TESTING REQUIREMENTS (see below)	X	

10. MASONRY TESTING REQUIREMENTS

TESTING METHOD OPTIONS	PRIOR TO CONSTRUCTION	DURING CONSTRUCTION
METHOD 1: MASONRY PRISM TESTING	5 PRISMS	3 PRISMS FOR EVERY 5,000 S.F. OF WALL
METHOD 2: MASONRY PRISM TEST RECORD	APPROVED 30 PRISM RECORD	3 PRISMS FOR EVERY 5,000 S.F. OF WALL
METHOD 3: UNIT STRENGTH METHOD	UNITS AND GROUT OR 5 PRISM	UNITS AND GROUT OR 3 PRISMS FOR EVERY 5,000 S.F. OF WALL

PERIODIC INSPECTIONS SHALL BE PERFOMED AT LEAST TWICE A DAY FOR A MINIMUM OF 1 HOUR EACH VISIT.

CAST-IN-PLACE CONCRETE

1. VERIFY ALL DIMENSIONS. COORDINATE WITH ARCHITECTURAL PLANS PRIOR TO CONSTRUCTION AND NOTIFY ARCHITECT AND/OR ENGINEER OF ANY DISCREPANCIES.
2. ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH THE AMERICAN CONCRETE INSTITUTE SPECIFICATIONS, ACI #301-05 LATEST EDITION. DRILLED PIERS SHALL COMPLY WITH ACI 336.1-01 AND ACI 336.3R-05
3. ALL DETAILING, FABRICATION AND ERECTION OF REINFORCING BARS, ACCESSORIES UNLESS OTHERWISE NOTED, SHALL BE IN ACCORDANCE WITH THE ACI "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE", ACI #315 LATEST EDITION
4. THE MINIMUM 28 DAYS CYLINDER STRENGTH SHALL BE AS FOLLOWS:

LOCATION	STRENGTH AT 28 DAYS	CONCRETE WEIGHT	WATER/CEMENT RATIO	SIZE OF LARGE AGGREGATE	MAXIMUM SLUMP
DRILLED PIERS	5000 PSI	NWC	0.5	1 1/2"	5"
PIER CAPS	5000 PSI	NWC	0.5	1 1/2"	5"
SPREAD FOOTINGS	3000 PSI	NWC	0.5	1 1/2"	5"
WALL FOOTINGS	3000 PSI	NWC	0.5	1 1/2"	5"
GRADE BEAMS	3000 PSI	NWC	0.5	1 1/2"	5"
SLAB-ON-GRADE	3000 PSI	NWC	0.5	1 1/2"	5"
RETAINING WALLS	4000 PSI	NWC	0.5	3/4"	6"
CAST-IN-PLACE COLUMNS	4000 PSI	NWC	0.5	1"	5"
PEDESTALS	3000 PSI	NWC	0.5	1"	5"
ALL OTHER WALLS	4000 PSI	NWC	0.5	3/4"	6"
GROUT INFILL	3000 PSI	NWC	0.5	3/8"	11"
MASONRY COLUMNS	3500 PSI	NWC	0.5	3/8"	11"
LINTELS	3000 PSI	NWC	0.5	3/8"	11"
HOUSEKEEPING PADS	3000 PSI	NWC	0.5	1"	5"
ALL OTHER CONCRETE U.N.O.	3000 PSI	NWC	0.5	1"	5"

*ALL MIXES SHALL HAVE A MINIMUM OF 5 SACKS OF CEMENTITIOUS MATERIAL PER CUBIC YARD REGARDLESS OF STRENGTH OBTAINED.

5. NO HORIZONTAL CONSTRUCTION JOINTS WILL BE PERMITTED IN SLABS OR BEAMS.
6. VERTICAL CONSTRUCTION JOINTS IN SLABS ARE TO BE AS SHOWN ON PLANS OR AS APPROVED BY ENGINEER.
7. ALL OPENINGS IN SLAB (FOR PIPING, DRAINS, ETC.) SHALL BE SEALED WITH 1/2 SEALANT '2A' (SELF-LEVELING 2-PART POLYURETHANE).
8. UTILITIES THAT PROJECT THROUGH SLAB FLOORS SHOULD BE DESIGNED WITH EITHER SOME DEGREE OF FLEXIBILITY OR WITH SLEEVES IN ORDER TO PREVENT DAMAGE TO THESE LINE SHOULD VERTICAL MOVEMENT OCCUR.
9. BACKFILL AROUND PERIMETER TO PROVIDE POSITIVE DRAINAGE AWAY FROM SLAB.
10. FLOOR TOLERANCES

F-NUMBER SYSTEM	COMPOSITE	MINIMUM LOCAL VALUE
FLATNESS (F_F)	30	23
LEVELNESS (F_L)	25	19

IN ALL INSTANCES MINIMUM SLAB THICKNESS SHALL BE OBTAINED. COORDINATE SLAB FINISHES WITH ARCHITECTURAL PLANS.

11. ANCHOR BOLTS, DOWELS, INSERTS, ETC. SHALL BE SECURELY TIED IN PLACE PRIOR TO PLACING CONCRETE.
12. REFER TO ARCHITECTURAL, MECHANICAL, PLUMBING, AND ELECTRICAL DRAWINGS FOR ALL MOLDS. GROOVES, REGLETS, ORNAMENTAL CLIPS, PIPES, CONDUITS, INSERTS, ETC. TO BE CAST IN CONCRETE. PROVIDE OVERSIZED SLEEVES FOR PLUMBING AND ELECTRICAL CONDUITS AND PIPES. NO PIPES OR DUCTS SHALL BE PLACED IN CONCRETE, FOOTINGS, OR SLAB UNLESS SPECIFICALLY DETAILED IN THESE PLANS, OR AS DIRECTED BY THE ENGINEER.
13. MECHANICALLY VIBRATE ALL CONCRETE WHEN PLACED.
14. CONCRETE TESTING SHALL BE ONE SET OF CYLINDERS FOR EVERY 50 CUBIC YARDS OR PORTION THEREOF FOR EACH TYPE OF CONCRETE POURED ON ANY GIVEN DAY. ONE SET CONSISTS OF 2 CYLINDERS TESTED FOR COMPRESSION AT 7 DAYS AND 2 CYLINDERS AT 28 DAYS.
15. NO CONCRETE PLACEMENT IS PERMITTED WHEN AMBIENT TEMPERATURE IS BELOW 50° F.
16. NO CONCRETE PLACEMENT IS PERMITTED DURING RAIN FALL.
17. ALL EXPOSED CONCRETE BEAMS AND COLUMNS SHALL BE FREE OF HONEYCOMBS AND DISCOLORATION. CONCRETE SHALL HAVE A SMOOTH SURFACE.
18. EARTH FORMS: FORMS FOR FOOTINGS MAY BE CUT INTO EARTH PROVIDED THAT EARTH IS DRY, STABLE, LEVEL AND SOUND. PROVIDE A 2x12 VERTICAL BOARD FORM MINIMUM BELOW BRICK LUG ELEVATION AT ALL PERIMETER GRADE BEAMS AND FOOTINGS.
19. VAPOR BARRIER
   A. VAPOR BARRIER (UNDER SLAB): SHALL CONFORM TO ASTM E1745, CLASS A OR BETTER AND SHALL HAVE A MINIMUM WATER VAPOR PERMEANCE OF 0.01 PERMS WHEN TESTED IN ACCORDANCE WITH ASTM E96. VAPOR RETARDANT SHALL BE NOT LESS THAN 15 MILS THICK.

   APPROVED PRODUCTS
   A. STEGO WRAP (15 MIL). BY STEGO INDUSTIES LLC. (887) 464-7834.

   INSTALLATION
   A. LAY SHEETS SMOOTHLY, STRETCH AND WEIGHT EDGES, LAP JOINTS TWELVE (12) INCHES AND SEAL WITH TAPE AS SPECIFIED BY VAPOR BARRIER MANUFACTURER. TURN BARRIER UP SIX 6 INCHES AT WALLS AND AT ALL PIPES, ABUTMENTS, ETC. TAPE AND SEAL AT PENETRATIONS AND AT EDGES.
   B. AT GRADE BEAMS, EXTEND VAPOR RETARDANT DOWN SIDES OF BEAM TRENCHES (AND FOOTING EXCAVATIONS) TO WITHIN 4" OF TRENCH BOTTOM AND SECURE TO SIDES OF TRENCH. EXTEND BARRIER ACROSS BOTTOM OF BEAM TRENCH.

   PATCHING:
   A. PATCH ALL PUNCTURES WITH A MINIMUM OVERLAP OF 6" IN ALL DIRECTIONS AND TAPE AROUND ENTIRE PERIMETER OF REPAIR.

A. PREINSTALLATION CONFERENCE:

1. AT LEAST 30 DAYS PRIOR TO THE START OF THE CONCRETE SLAB CONSTRUCTION SCHEDULE, THE CONTRACTOR SHALL CONDUCT A MEETING TO REVIEW THE PROPOSED MIX DESIGNS AND TO DISCUSS THE REQUIRED METHODS AND PROCEDURES TO ACHIEVE THE REQUIRED CONCRETE CONSTRUCTION. THE CONTRACTOR SHALL SEND A PRE-CONCRETE CONFERENCE AGENDA TO ALL ATTENDEES 20 DAYS PRIOR TO THE SCHEDULED DATE OF THE CONFERENCE.
2. THE CONTRACTOR SHALL REQUIRE RESPONSIBLE REPRESENTATIVES OF EVERY PARTY CONCERNED WITH THE CONCRETE WORK TO ATTEND THE CONFERENCE, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:
   A) CONTRACTOR'S SUPERINTENDENT
   B) LABORATORY RESPONSIBLE FOR CONCRETE MIXES AND/ OR FIELD QUALITY CONTROL
   C) READY-MIX CONCRETE PRODUCER
   D) CONCRETE SUBCONTRACTOR
   E) ADMIXTURE MANUFACTURER(S)
   F) LIQUID DENSIFIER AND SEALER MANUFACTURER
   G) LIQUID DENSIFIER AND SEALER APPLICATOR
   H) JOINT FILLING APPLICATOR
3. MINUTES OF THE MEETING SHALL BE RECORDED, TYPED AND PRINTED BY THE CONTRACTOR AND DISTRIBUTED BY HIM TO ALL CONCERNED PARTIES, INCLUDING THE OWNER'S REPRESENTATIVE, THE ARCHITECT, AND THE STRUCTURAL ENGINEER WITHIN FIVE DAYS OF THE MEETING.

B. CONCRETE MATERIAL:

1. PORTLAND CEMENT: ASTM C 150, TYPE I. USE ONE BRAND OF CEMENT THROUGHOUT THE PROJECT.
2. COARSE AND FINE AGGREGATES: ASTM C33. COMBINED AGGREGATE GRADATION FOR SLABS ON GRADE AND OTHER DESIGNATED CONCRETE SHALL BE 8% - 18% FOR LARGE TOP AGGREGATES (1 1/2") OR 8% - 22% FOR SMALLER TOP SIZE AGGREGATES (1" OR 3/4") RETAINED ON EACH SIEVE BELOW THE TOP SIZE AND ABOVE THE NO. 100 SIEVE. SLABS ON GRADE SHALL HAVE A MAXIMUM AGGREGATE SIZE OF 1-1/2" FOOTINGS AND PIERS 1" AND BEAMS 3/4".
3. WATER: COMPLYING WITH ASTM C 94.
4. ALL CONCRETE SHALL CONTAIN "POZZOLITH" ADMIX AS PER MANUFACTURER'S SPECIFICATIONS, IN ACCORDANCE WITH ASTM C494.

C. ADMIXTURES:

1. AIR-ENTRAINING ADMIXTURES: SHALL CONFORM TO ASTM C-260. ADMIXTURE MANUFACTURER SHALL PROVIDE WRITTEN CERTIFICATION THAT THE AIR-ENTRAINING ADMIXTURE IS COMPATIBLE WITH OTHER REQUIRED ADMIXTURES. ALL EXTERIOR SLABS SHALL BE AIR-ENTRAINED (4% - 6%). ACCEPTABLE PRODUCTS: EUCLID CHEMICAL AEA-92 AND AIRMIX 200, MASTER BUILDERS MICROAIR, W.R. GRACE DARAVAIR 1000 AND DAREX-11.
   NOTE: AIR-ENTRAINING ADMIXTURE SHALL NOT BE USED ON INTERIOR CONCRETE.
2. WATER-REDUCING ADMIXTURE: SHALL CONFORM TO ASTM C494, TYPE A AND CONTAIN NOT MORE THAN 0.05% CHLORIDE IONS. ACCEPTABLE PRODUCTS: EUCLID CHEMICAL WR-89 AND WR-91, MASTER BUILDERS 200N AND 322N, W.R. GRACE WRDA 36 AND WRDA 64.
3. WATER REDUCING, RETARDING ADMIXTURE: SHALL CONFORM TO ASTM C494, TYPE D, AND CONTAIN NOT MORE THAN 0.05% CHLORIDE IONS. ACCEPTABLE PRODUCTS: EUCLID CHEMICAL RETARDER 75, MASTER BUILDERS POZZOLITH R, W.R. GRACE DARATARD 17.

CAST-IN-PLACE CONCRETE (CONT.)

4. HIGH RANGE WATER-REDUCING ADMIXTURE (SUPERPLASTICIZER): SHALL CONFORM TO ASTM C494, TYPE F OR TYPE G AND CONTAIN NOT MORE THAN 0.05% CHLORIDE IONS. ACCEPTABLE PRODUCTS : EUCLID CHEMICAL EUCON 37, MASTER BUILDERS REOBUILD 1000 W.R. GRACE DARACEM - 1000.
5. WATER-REDUCING, NON-CORROSIVE ACCELERATING ADMIXTURE: SHALL CONFORM TO ASTM C494, TYPE C OR E, AND CONTAIN NOT MORE CHLORIDE IONS THAN ARE PRESENT IN MUNICIPAL DRINKING WATER. THE ADMIXTURE MANUFACTURER MUST HAVE LONG-TERM, NON-CORROSIVE TEST DATA FROM AN INDEPENDENT TESTING LABORATORY (OF AT LEAST A YEAR'S DURATION) USING AN ACCEPTABLE ACCELERATED CORROSION TEST METHOD SUCH AS THAT USING ELECTRICAL POTENTIAL MEASURES. ACCEPTABLE PRODUCTS: EUCLID CHEMICAL ACCELGUARD 80/90 AND ACCELGUARD NCA, MASTER BUILDERS NC534 AND POZZUTEC 20, W.R. GRACE POLARSET.
6. PROHIBITED ADMIXTURES:
   a.) CALCIUM CHLORIDE OR ADMIXTURES CONTAINING MORE THAN 0.05% CHLORIDE IONS ARE NOT PERMITTED.

D. EVAPORATION RETARDER:

1. WATERBORNE, MONOMOLECULAR FILM FORMING, MANUFACTURED FOR APPLICATION TO FRESH CONCRETE.
   a.) ACCEPTABLE PRODUCTS:
   "EUCOBAR" BY THE EUCLID CHEMICAL COMPANY - CONTACT: PHIL BRANDT (877) 438-3826

E. CURING MATERIALS:

1. EXTERIOR CURING: ALL EXTERIOR CONCRETE SLABS SHALL BE CURED USING A LIQUID MEMBRANE-FORMING CURING COMPOUND. THE LIQUID MEMBRANE-FORMING CURING COMPOUND SHALL MEET THE REQUIREMENTS OF ASTM C 1315 WITH A MAXIMUM V.O.C. CONTENT OF 700 G/L.
   a.) ACCEPTABLE PRODUCTS:
   "SUPER REZ SEAL" BY EUCLID CHEMICAL COMPANY - CONTACT PHIL BRANDT (877) 438-3826
2. INTERIOR CURING: ALL INTERIOR CONCRETE SLABS SHALL BE CURED USING A REDUCED ODOR, DISSIPATING LIQUID MEMBRANE FORMING CURING COMPOUND THAT IS FORMULATED FROM HYDROCARBON RESINS. THE DISSIPATING LIQUID MEMBRANE FORMING CURING COMPOUND SHALL MEET THE REQUIREMENTS OF ASTM C-309 AND V.O.C. CONTENTS IN ACCORDANCE TO EPA 40 CFR, PART 59, TABLE I, SUBPART D FOR CONCRETE CURING COMPOUNDS WITH A MAXIMUM V.O.C. CONTENT OF 350 G/L. APPLY AT 400 S.F./GALLON.
   a.) ACCEPTABLE PRODUCTS:
   "KUREZ DR VOX" BY THE EUCLID CHEMICAL COMPANY - CONTACT PHIL BRANDT (877) 438-3826

ALL CONCRETE SLABS SHALL ALSO BE MAINTAINED MOIST FOR 7 DAYS

F. CONCRETE MIXES

1. COMPLY WITH ACI 301 REQUIREMENTS FOR CONCRETE MIXTURE, U.N.O..
2. PREPARE DESIGN MIXES SIGNED AND SEALED BY A PROFESSIONAL ENGINEER, PROPORTIONED ACCORDING TO ACI 301, FOR NORMAL WEIGHT CONCRETE DETERMINED BY EITHER LABORATORY TRIAL MIX OR FIELD TEST DATA AS FOLLOWS:
   CONCRETE MATERIALS INCLUDED IN THE MIX DESIGN SHALL BE THE SAME MATERIALS PROVIDED TO THE PROJECT, AND SHALL BE PREPARED BY AN INDEPENDENT TESTING LABORATORY APPROVED BY THE OWNER. THE LABORATORY MIX DESIGN SHALL NOT EXCEED THE DESIRED JOB STRENGTH OF CONCRETE BY 1,200 PSI. FOUR COPIES OF THE MIX DESIGN SHALL BE SUBMITTED TO THE OWNER BEFORE CONCRETE WORK BEGINS.
3. SLUMP: CONCRETE CONTAINING HRWR SHALL HAVE A MAXIMUM SLUMP OF 8" (200MM). ALL OTHER CONCRETE SHALL NOT EXCEED 4 INCHES (100 MM) UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
4. ADJUSTMENT TO CONCRETE MIXES: MIX DESIGN ADJUSTMENTS MAY BE REQUESTED BY CONTRACTOR WHEN CHARACTERISTICS OF MATERIALS, JOB CONDITIONS, WEATHER, TEST RESULTS OR OTHER CIRCUMSTANCES WARRANT, AT NO ADDITIONAL COST TO OWNER AND AS ACCEPTED BY OWNER. LABORATORY TEST DATA FOR REVISED MIX DESIGN AND STRENGTH RESULTS MUST BE SUBMITTED TO AND ACCEPTED BY OWNER BEFORE USING IN WORK. BOTH THE CONCRETE TESTING AND INSPECTION AGENCY AND THE CONCRETE CONTRACTOR SHALL SATISFY THEMSELVES THAT THE CONCRETE MIX DESIGN WILL PRODUCE A CONCRETE WHICH WILL MEET THE SPECIFICATIONS FOR THIS PROJECT. IN ADDITION, THE CONTRACTOR AND CONCRETE FINISHER SHALL VERIFY THAT THE WORKABILITY, FINISHABILITY AND SETTING TIMES ARE APPROPRIATE FOR SLAB INSTALLATIONS. PLACEMENT SHALL BE MADE BY CHUTE DIRECTLY FROM THE CONCRETE TRUCKS. IF PUMPING OF THE CONCRETE IS CONTEMPLATED FOR ANY SPECIAL LOCATIONS, THE PROPORTIONS ESTABLISHED ABOVE SHALL NOT BE ALTERED TO SUIT THE CAPABILITIES OF THE PUMPING EQUIPMENT.
5. READY MIX CONCRETE SHALL COMPLY WITH REQUIREMENTS OF ASTM C94. WHEN AIR TEMPERATURE IS BETWEEN 85° AND 90° F, REDUCE MIXING AND DELIVERY TIME FROM 90 MINUTES TO 75 MINUTES; WHEN AIR TEMPERATURE IS ABOVE 90° F, REDUCE MIXING AND DELIVERY TIME TO 6O MINUTES.
6. WATER CEMENT RATIO SHALL BE BASED ON SURFACE DRY MATERIAL.

G. CONTRACTION JOINTS IN SLABS-ON-GRADE:

FORM WEAKENED-PLANE CONTRACTION JOINTS, SECTIONING CONCRETE INTO AREAS AS INDICATED. CONSTRUCT CONTRACTION JOINTS FOR A DEPTH EQUAL TO AT LEAST ONE-FOURTH OF THE CONCRETE THICKNESS, AS FOLLOWS:
SAWED JOINTS: ALL SAW CUTTING SHALL BE ACCOMPLISHED WITH A SOFT-CUT SAW AS SOON AS THE SLAB WILL SUPPORT THE WEIGHT OF THE SAW AND OPERATOR. NOTE: CONCRETE DUST SHALL BE REMOVED COMPLETELY AND IMMEDIATELY. IF CHALK LINES ARE USED FOR SAW CUTS, ALL CHALK REMAINING ON SLAB SHALL BE REMOVED COMPLETELY AND IMMEDIATELY AFTER SAWING.

H. FLOOR SLAB TOLERANCES:

COMPLY WITH ACI 117, "SPECIFICATIONS FOR TOLERANCES FOR CONCRETE CONSTRUCTION AND MATERIALS." ALL INTERIOR FLOOR SLABS SHALL MEET THE REQUIREMENTS OF A TYPE 5, SINGLE COURSE, HARD STEEL - TROWELED FINISH AS DESCRIBED IN ACI 302.IR- LATEST EDITION.

I. CONCRETE CURING AND PROTECTION:

1. EXTERIOR SLAB - CURING:
   a) FIRST, ALL EXTERIOR CONCRETE SLABS SHALL BE CURED USING A LIQUID MEMBRANE-FORMING CURING COMPOUND TO BE APPLIED EVENLY AND UNIFORMLY PER MANUFACTURER'S INSTRUCTIONS AS SOON AS POSSIBLE AFTER FINAL FINISHING. SURFACE SHALL BE DAMP, BUT NOT WET AND CAN NO LONGER BE MARRED BY A WALKING WORKMAN. ALL APPLICATIONS SHALL BE MADE BY AN APPLICATOR CERTIFIED BY THE MANUFACTURER, AND WHEN SURFACE AND AIR TEMPERATURE IS ABOVE 50° F. BEGIN CURING AFTER FINISHING CONCRETE, BUT NOT BEFORE FREE WATER HAS DISAPPEARED FROM CONCRETE SURFACE. CURING COMPOUND SHALL BE PLACED WITHIN FOUR (4) HOURS AFTER CONCRETE HAS BEEN PLACED.
   b) SECOND, CONCRETE SHALL BE MAINTAINED ABOVE 50 DEGREES F AND IN A MOIST CONDITION FOR AT LEAST THE FIRST SEVEN (7) DAYS AFTER PLACEMENT.
2. INTERIOR SLABS - CURING:
   a) FIRST, ALL INTERIOR CONCRETE SLABS SHALL BE CURED USING A LIQUID MEMBRANE-FORMING CURING COMPOUND TO BE APPLIED EVENLY AND UNIFORMLY PER MANUFACTURER'S INSTRUCTIONS AS SOON AS POSSIBLE AFTER FINAL FINISHING. SURFACE SHALL BE DAMP, BUT NOT WET AND CAN NO LONGER BE MARRED BY A WALKING WORKMAN. ALL APPLICATIONS SHALL BE MADE BY AN APPLICATOR CERTIFIED BY THE MANUFACTURER, AND WHEN SURFACE AND AIR TEMPERATURE IS ABOVE 50° F. BEGIN CURING AFTER FINISHING CONCRETE, BUT NOT BEFORE FREE WATER HAS DISAPPEARED FROM CONCRETE SURFACE. CURING COMPOUND SHALL BE PLACED WITHIN FOUR (4) HOURS AFTER CONCRETE HAS BEEN PLACED.
   b) SECOND, CONCRETE SHALL BE MAINTAINED ABOVE 50 DEGREES F AND PONDED WITH WATER FOR SEVEN (7) DAYS AFTER CONCRETE PLACEMENT.
   c) THIRD, CONCRETE SLABS SHALL BE CURED USING A LIQUID MEMBRANE- FORMING CURING COMPOUND TO BE APPLIED EVENLY AND UNIFORMLY PER MANUFACTURER'S INSTRUCTIONS. SURFACE SHALL BE DAMP, BUT NOT WET AND CAN NO LONGER BE MARRED BY A WALKING WORKMAN. ALL APPLICATIONS SHALL BE MADE BY AN APPLICATOR CERTIFIED BY THE MANUFACTURER, AND WHEN SURFACE AND AIR TEMPERATURE IS ABOVE 50° F.
   d) AT CONCRETE WHERE FINISH OF SLAB IS TO BE POLISHED; PROVIDE BURLAP MEMBRANE DURING ENTIRE CONSTRUCTION OF THE BUILDING. (DO NOT PROVIDE CURING COMPOUND)
3. INTERIOR SLAB PROTECTION:
   TAKE THE FOLLOWING MEASURES TO PROTECT FLOOR SLAB:
   A. WRAP OR "DIAPER" ALL MOTORIZED AND HYDRAULIC EQUIPMENT TO PREVENT FLUID LEAKS.
   B. PROVIDE NON-MARKING TIRES ON RUBBER TIRED VEHICLES OR EQUIP RUBBER TIRES WITH TIRE BOOTS MADE OF NYLON FABRIC.
   C. SOURCE FOR DIAPERS AND BOOTS: R&R TIRE SURFACE PROTECTORS, INC., FORT COLLINS CO 80526, (970) 266-4082
   D. PROVIDE MATS AT ALL ENTRANCES TO PREVENT MUD STAINS.
   E. COVER SLAB PRIOR TO PAINTING. ALL SPILLS TO BE CLEANED WITH SOAP AND WATER. LACQUER THINNER WILL NOT BE ACCEPTABLE.

SPECIAL INSPECTION, MATERIALS TESTING.

1. RESPONSIBILITIES OF THE OWNER
   A. EMPLOY AND PAY THE SPECIAL INSPECTION AGENCY TO PERFORM INSPECTIONS SPECIFIED IN THIS SECTION, THOSE REQUIRED BY IBC 2012 CHAPTER 17, AND THOSE REQUIRED BY AUTHORITIES HAVING JURISDICTION.
   B. EMPLOY AND PAY THE MATERIALS TESTING LABORATORY TO PERFORM TESTS SPECIFIED IN THIS SECTION AND THOSE REQUIRED BY AUTHORITIES HAVING JURISDICTION.
      1) RETESTING - THE CONTRACTOR SHALL REIMBURSE THE OWNER FOR RE-TESTING WHERE RESULTS OF INSPECTIONS AND TESTS PROVE UNSATISFACTORY AND INDICATE NONCOMPLIANCE WITH REQUIREMENTS.
   C. EMPLOY THE DESIGN PROFESSIONAL RESPONSIBLE FOR THE STRUCTURAL DESIGN OR ANOTHER ENGINEER OR ARCHITECT DESIGNATED BY THE (DPR) TO PERFORM STRUCTURAL OBSERVATION. (REF 1702)
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING THE TEST AND/OR INSPECTION FIRM WITH A CONSTRUCTION SCHEDULE TO FACILITATE THE PROPER COORDINATION. ANY WORK PERFORMED WITHOUT SPECIAL INSPECTION IS SUBJECT TO REMOVAL AT CONTRACTOR'S EXPENSE
3. THE SPECIAL INSPECTOR SHALL FURNISH DAILY INSPECTION REPORTS TO THE BUILDING OFFICIAL, THE ARCHITECT, AND THE ENGINEER AT A MINIMUM PER WEEK FREQUENCY. THE SPECIAL INSPECTOR SHALL SUBMIT A FINAL REPORT, SIGNED BY BOTH HE AND HIS SUPERVISOR, STATING WHETHER THE WORK REQUIRING SPECIAL INSPECTION WAS IN CONFORMANCE WITH THE APPROVED PLANS AND SPECIFICATIONS AND THE WORKMANSHIP PROVISIONS OF THE CBC.
4. ALL DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION; THEN IF UNCORRECTED, TO THE PROPER DESIGN AUTHORITY AND THE BUILDING OFFICIAL.

FRAMING NOTES

1. FOR GENERAL NOTES SEE SHEET 34 AND 35.
2. FOR TYPICAL DETAILS SEE SHEET 32.
3. DIMENSIONS SHOWN ARE FOR GENERAL INFORMATION. COORDINATE WITH ARCHITECTURAL PLANS.
4. SEE ARCHITECTURAL ROOF PLAN FOR ROOF HATCHES.
5. INDICATES 8" CMU WALL #6 (V) AT 48" AND (1) #5 (H) AT 48" O.C., U.N.O. VERIFY CMU WALLS THICKNESS WITH ARCHITECTURAL PLANS, 8" CMU WALLS SHOWN ON STRUCTURAL PLANS ARE MINIMUM THICKNESS AND GOVERN OVER ARCHITECTURAL DRAWINGS.
6. INDICATES CMU LINTEL (NOT ALL LINTELS ARE SHOWN), SEE DETAIL 19/32.
7. PROVIDE CMU LINTEL WHERE MECH'L. DUCT PENETRATES CMU WALL, PER DETAIL
8. INDICATES WALL WIDTH x16" CMU PILASTER U.N.O. ON PLANS
9. FOR 8" CMU PILASTER, SEE DETAIL 14/32.
10. FOR STEEL LINTEL OVER OPENINGS, SEE DETAIL 15/32.
11. FOR ATTACHMENTS AT THE TOP OF CMU WALLS, SEE DETAILS

FOUNDATION NOTES

1. FOR GENERAL NOTES SEE SHEET 34 & 35.
2. FOR TYPICAL DETAILS NOT REFERENCE IN PLAN SEE SHEET 32.
3. CONTRACTOR/SUBCONCRACTOR IS RESPONSIBLE FOR VERIFYING ALL DIMENSIONS WITH ARCHITECTURAL PLANS BEFORE COMMENCING ANY WORK. THE CONTRACTOR/SUBCONTRACTOR SHALL REPORT ANY DISCREPANCIES TO THE ARCHITECT/ENGINEER BEFORE THE WORK HAS BEGUN.
4. REFER TO ARCHITECTURAL PLANS FOR ADDITIONAL DIMENSIONS.
5. REFER TO ARCHITECTURAL PLANS FOR FLOOR DRAINS.
6. 5" THK. SLAB ON GRADE w/ #4 AT 12" O.C. EACH WAY AT MID-DEPTH OF SLAB OVER 15 MIL STEGO WRAP OVER APPROVED COMPACTED FILL
7. SLAB CONTRACTION JOINT, SEE DETAIL 5/32.
8. FOOTING SCHEDULE, SEE DETAIL 20/33.
9. REFER TO ARCHITECTURAL FOR ALL RECESSED AREAS NOT SHOWN.
10. FOR DROP IN SLAB ON GRADE, REFER TO DETAIL 1/32.
11. REFER TO FRAMING PLAN FOR CMU WALL VERTICAL REINFORCEMENT.
12. FOR TYPICAL THICKEN SLAB UNDER NON BEARING CMU WALL, REFER TO DETAIL 11/32.
13. FOR TYPICAL THICKEN SLAB UNDER NON BEARING CMU WALL WITH DEPRESSED SLAB. REFER TO DETAIL 8/32.
14. FOR 8" & 12" CMU PILASTER, SEE DETAILS 14/32.

FOUNDATION SUBGRADE

1. PREPARATION OF EXISTING GROUND
   A) ALL AREAS TO SUPPORT SELECT FILL SHALL BE STRIPPED OF ALL CONCRETE, ASPHALT, VEGETATION AND/OR ORGANIC TOPSOIL. REMOVE ALL TREES AND ROOT UNDER BUILDING'S FOOT PRINT INCLUDING CANOPIES AND OTHER STRUCTURAL FOUNDATIONS SHOWN IN THESE DRAWINGS.
   B) MINIMUM DEPTH OF REMOVAL: 24 INCHES
   C) EXTEND BEYOND BUILDING FOOT PRINT: 5 FEET
   D) REMOVE THE EXISTING SUBGRADE SOILS DOWN TO A MINIMUM ELEVATION OF: 4.5 FEET BELOW FINISH FLOOR ELEVATION
   E) EXTEND BEYOND BUILDING FOOT PRINT 5 FEET
   F) THE EXPOSED SUBGRADE SHOULD BE PROOF ROLLED IN ACCORDANCE WITH ITEM 216 OF TxDOT's 2004 STANDARD SPECIFICATIONS. WEAK OR SOFT AREAS IDENTIFIED SHOULD BE REMOVED AND REPLACED WITH SELECT FILL IN THE PROPOSED BUILDING AREAS.
   G) THE EXPOSED SUBGRADE SHALL BE SCARIFIED TO A DEPTH OF 12 INCHES AND MOISTURE CONDITIONED TO WITHIN -2 TO +2 PERCENT OF THE OPTIMUM MOISTURE CONTENT.
   H) THE SUBGRADE SHALL BE COMPACTED TO 98 PERCENT OF THE MAXIMUM DENSITY AS DETERMINED BY THE STANDARD MOISTURE-DENSITY RELATION (ASTM D-698). FOLLOWING COMPLETE CLEARING AND PREPARATION OF THE SITE FOR CONSTRUCTION, THE GEOTECHNICAL ENGINEER SHALL OBSERVE THE SITE TO DETERMINE THAT SATISFACTORY PREPARATION HAS BEEN ACCOMPLISHED.
2. SELECT FILL MATERIAL
   A) THE FOLLOWING SOILS, AS CLASSIFIED ACCORDING TO THE USCS, MAY BE CONSIDERED SATISFACTORY FOR USE AS SELECT FILL MATERIALS AT THIS SITE:
      SM, SC, GM, GC, CL, ML, AND COMBINATIONS OF THESE SOILS.
   B) AGGREGATE BASE COURSE
      THE CLAYEY GRAVEL AND CALICHE MATERIALS SHOULD MEET THE GRADATION REQUIREMENTS OF ITEM 247, TYPE B, GRADES 1 THROUGH 3 AS SPECIFIED IN THE 2004 TxDOT STANDARD SPECIFICATIONS MANUAL AND A PLASTICITY INDEX BETWEEN 7 AND 20. CRUSHED LIMESTONE OR CRUSHED CONCRETE MATERIAL SHOULD MEET THE REQUIREMENTS OF 2004 TxDOT ITEM 247, TYPE A OR D, GRADE 1. THE SELECT FILL MATERIALS SHOULD BE FREE OF ORGANIC MATERIAL AND DEBRIS, AND SHOULD NOT CONTAIN STONES LARGER THAN 2 INCHES IN THE MAXIMUM DIMENSION.
   C) THE FOLOWING SOILS, AS CLASSIFIED ACCORDING TO THE USCS, ARE NOT CONSIDERED SATISFACTORY FOR USE AS SELECT FILL MATERIALS AT THIS SITE:
      CH, MH, OH, OL, AND Pt
      THE NATIVE SOILS AT THIS SITE ARE NOT CONSIDERED SUITABLE FOR USE AS SELECT FILL MATERIAL.
   D) * FINISH FLOOR SHALL BE 18" MINIMUM ABOVE TOP OF CURB ELEVATION OR 18" MINIMUM ABOVE CROWN OF STREET, OR AS INDICATED ON CIVIL DRAWINGS, INCREASE INDICATED AMOUNT OF FILL AS REQUIRED TO ACHIEVE MOST STRINGENT REQUIREMENT
      MINIMUM AMOUNT OF FILL: 49 INCHES SELECT FILL MATERIAL
      PLASTICITY INDEX: BETWEEN 10 & 17
      MAXIMUM LIQUID LIMIT: 40
      NO ORGANIC OR OTHER PERISHABLE MATERIAL
      NO STONES LARGER THAN TWO (2) INCHES
3. PLACING SELECT FILL
   FILL LIFTS: NOT EXCEEDING 6 INCHES, COMPACTED LIFTS (LOOSE LIFTS NOT EXCEEDING 8 INCHES IN THICKNESS)
   MINIMUM AMOUNT OF SELECT FILL: 49 INCHES SELECT FILL MATERIAL
4. COMPACTION OF SELECT FILL
   MOISTURE: -2% TO +2%
   COMPACTION: 98%
5. COMPACTION TESTING
   ATTERBERG LIMITS: ONE AT A RATE OF 5,000 CUBIC YARDS.
   COMPACTION: ONE TEST PER 3,000 SQUARE FEET PER LIFT (MINIMUM OF 3 PER LIFT)
6. THE SOILS ENGINEER SHALL BE THE OWNERS REPRESENTATIVE TO CONTROL THE PLACEMENT OF COMPACTED FILL. THE SOILS ENGINEER SHALL APPROVE THE SUB-GRADE PREPARATION, THE FILL MATERIALS, THE METHOD OF PLACEMENT AND COMPACTION AND SHALL GIVE WRITTEN APPROVAL OF THE COMPLETED FILL.
7. THE SOILS REPORT/FOUNDATION INVESTIGATION IS TO BE CONSIDERED A PART OF THESE PLANS AND SHALL BE COMPLIED WITH BY THE CONTRACTOR. ALL EARTHWORK AND GRADING SHALL BE ACCOMPLISHED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE FOUNDATION INVESTIGATION OR PER NOTES 1 THRU 4 ABOVE WHICHEVER HAS THE MOST STRINGENT REQUIREMENTS.
8. IN THE EVENT FOUNDATION EXCAVATIONS ARE CARRIED TO A DEPTH GREATER THAN REQUIRED, THE ADDITIONAL DEPTH SHALL BE FILLED WITH THE SAME CONCRETE AS THAT USED FOR FOOTING AT NO ADDITIONAL EXPENSE TO THE OWNER. NO UNCONTROLLED FILL WILL BE PERMITTED.
9. THE FOOTING EXCAVATIONS SHALL BE KEPT FREE FROM LOOSE MATERIAL AND STANDING WATER.
10. THE FOUNDATION EXCAVATIONS SHOULD BE OBSERVED BY THE SOILS ENGINEER PRIOR TO STEEL OR CONCRETE PLACEMENT TO ASSESS THAT THE FOUNDATION MATERIALS ARE CAPABLE OF SUPPORTING THE DESIGN LOADS AND ARE CONSISTENT WITH THE MATERIALS DISCUSSED IN THE REPORT. THIS IS ESPECIALLY IMPORTANT TO IDENTIFY THE ACCEPTABILITY OF THE SUBGRADE OR FILL MATERIAL UNDER THE FOOTING. SOFT OR LOOSE SOIL ZONES ENCOUNTERED AT THE BOTTOM OF THE FOOTING OR BEAM EXCAVATIONS SHOULD BE REMOVED TO THE LEVEL OF COMPETENT SOIL AS DIRECTED BY THE GEOTECHNICAL ENGINEER. CAVITIES FORMED AS A RESULT OF EXCAVATION OF SOFT OR LOOSE SOIL ZONES SHOULD BE BACKFILLED WITH LEAN CONCRETE OR SELECT FILL AS DETERMINED BY THE GEOTECHNICAL ENGINEER
11. CARE SHOULD BE TAKEN TO SHAPE THE BUILDING AREAS SUCH THAT WATER WILL NOT POND AROUND THE STRUCTURE DURING CONSTRUCTION AND CAUSE THE NEAR SURFACE CLAYS TO SWELL. THE PROPOSED STRUCTURE SHALL BE ISOLATED FROM ANY MOISTURE SOURCE WHICH MIGHT ALSO CAUSE SWELLING OF THE CLAYS AFTER COMPLETION OF THE CONSTRUCTION.
12. WHEN THE STRUCTURE IS COMPLETE, THE GROUND SURFACE SHOULD SLOPE AWAY FROM THE STRUCTURE AND DOWN SPOUTS SHOULD CARRY RUNOFF WATER SEVERAL FEET FROM THE BUILDING, PREFERABLY INTO PAVED AREAS OR BEWERS, BEFORE DISCHARGING.
13. DO NOT PLANT OR LEAVE IN PLACE DEEP ROOTED TREES WITHIN PROXIMITY TO THE PERIMETER OF THE STRUCTURE. DEEP ROOTED TREES HAVE POTENTIAL TO REMOVE MOISTURE FROM BENEATH THE BUILDING IF PLANTED CLOSE ENOUGH TO ALLOW THE ROOT BULB EXTEND NEAR OR BENEATH THE BUILDING.
14. AIR CONDITIONING CONDENSER DRAIN LINES TO DISCHARGE WATER A MINIMUM OF 5 FEET FROM THE PERIMETER OF THE STRUCTURE. THE DISCHARGE AREA SHALL HAVE SUFFICIENT SLOPE AWAY FROM THE STRUCTURE TO PREVENT STANDING WATER.
15. THE FINAL ONE (1) FOOT OF FILL OUTSIDE THE BUILDING AREA SHOULD CONSIST OF A COHESIVE CLAYEY (CL) SOIL. FILL CAN NOT BE ALLOWED TO DRY OUT DURING OR AFTER COMPACTION. (P1 BETWEEN 15 AND 25)
16. NOTE THAT SOME LEVELS OF RISK ARE ASSOCIATED WITH ALL FOUNDATION SYSTEMS AND THERE IS NO SUCH THING AS A "ZERO RISK" FOUNDATION. IT ALSO SHOULD BE NOTED THAT THE FOUNDATION PROVIDED IS NOT DESIGNED TO RESIST SOIL MOVEMENT AS A RESULT OF SEWER/PLUMBING LEAKS, EXCESIVE IRRIGATION, NON UNIFORM IRRIGATION, POOR DRAINAGE, AND WATER PONDING NEAR THE FOUNDATION SYSTEM

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DATE: 7/29/19
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REVISED BY: IP
CHECKED BY: IP

TITLE: EDINBURG ECONOMIC DEVELOPMENT CORP. NORTH PARK SPORT COMPLEX
GENERAL NOTES

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
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SCALE: FULL: N.T.S. HALF: N.T.S.

TBPE REG. NO. F-13016

STATE OF TEXAS — ISAEL POSADAS — 89435 — LICENSED PROFESSIONAL ENGINEER
8/15/19.

DATE: 8/15/19

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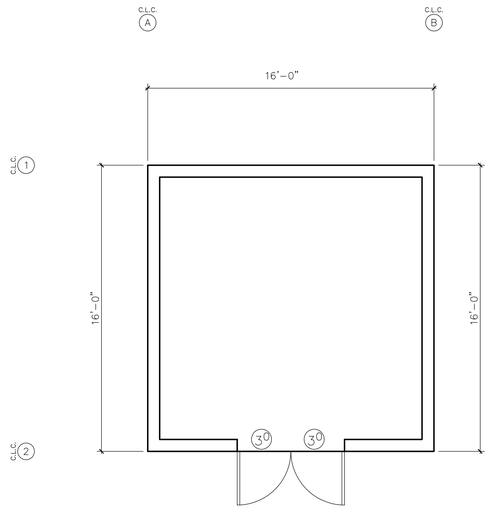

FLOOR PLAN
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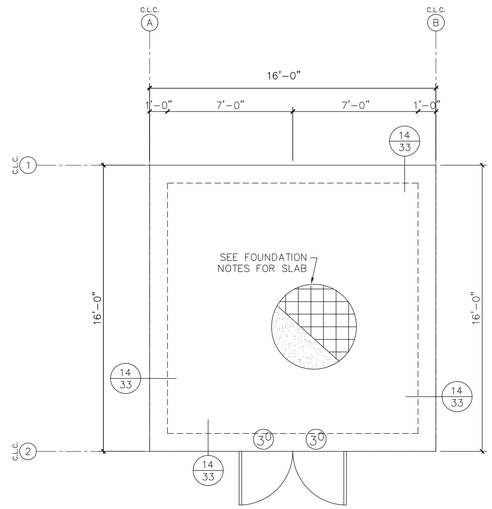
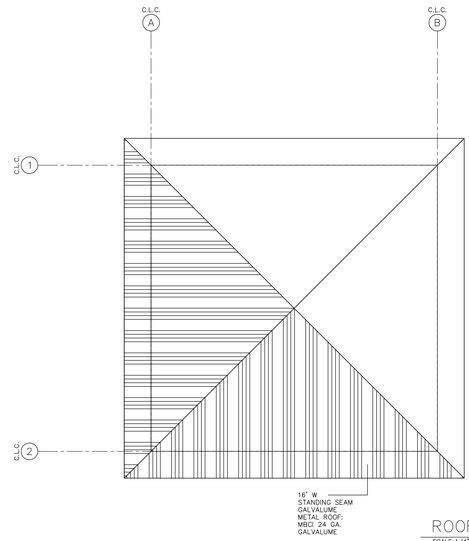


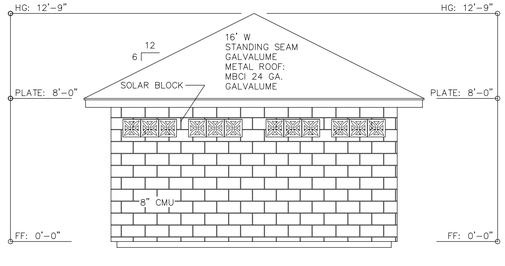
FOUNDATION PLAN
SCALE:1/4"=1'-0"



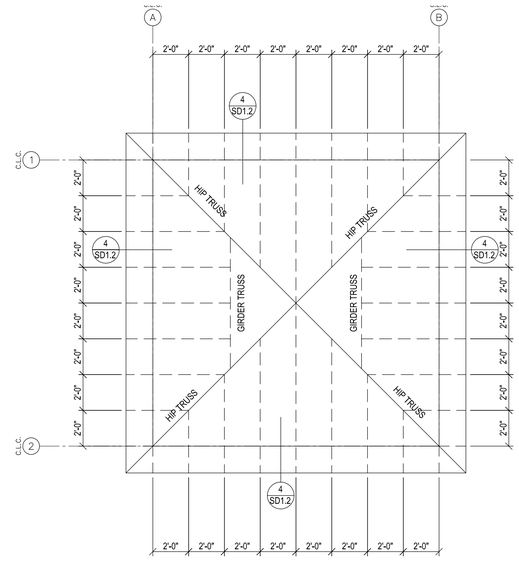
ROOF PLAN
SCALE:1/4"=1'-0"

FRONT ELEVATION
SCALE:1/4"=1'-0"

REAR ELEVATION
SCALE:1/4"=1'-0"



RIGHT/LEFT ELEVATION
SCALE:1/4"=1'-0"



FRAMING PLAN
SCALE:1/4"=1'-0"

FILE NAME:	
DATE:	7/29/19
SURVEYED BY:	
DESIGNED BY:	IF
DRAWN BY:	IF
REVISED BY:	IP
CHECKED BY:	IP

TITLE:
EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
SPLASH BUILDING PLANS

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE: FULL: N.T.S.
HALF: N.T.S.

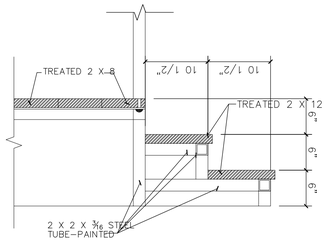
TBPE REG. NO. F-13016

STATE OF TEXAS
ISAEL POSADAS
89435
LICENSED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY ISAEL POSADAS, P.E. No. 89435 ON AUGUST 15, 2019. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION OF THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

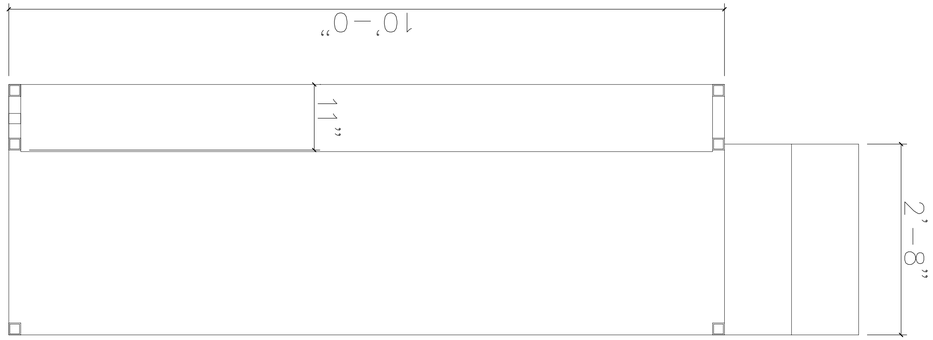
DATE: 8/15/19

SHEET NO.:
36 OF 37



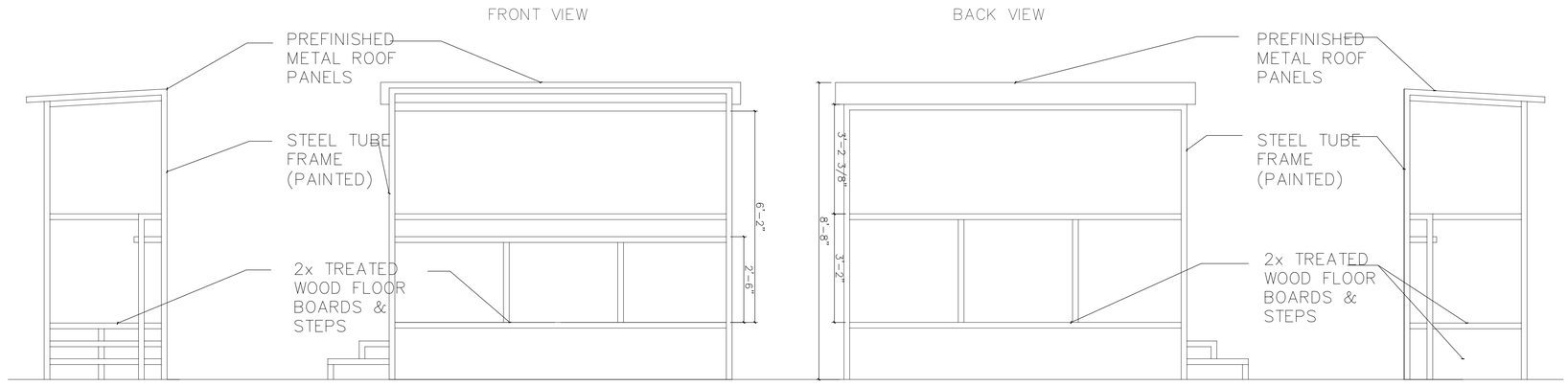
1 STAIR DETAIL

SCALE:



1 SCORER'S BENCH-PLAN

SCALE:



1 SCORER'S BENCH

SCALE:

FILE NAME:	
DATE:	7/29/19
SURVEYED BY:	
DESIGNED BY:	IF
DRAWN BY:	IF
REVISED BY:	IP
CHECKED BY:	IP

TITLE:
EDINBURG ECONOMIC DEVELOPMENT CORP
NORTH PARK SPORT COMPLEX
SCORER'S BENCH IMPROVEMENTS

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE:	FULL:	N.T.S.
	HALF:	N.T.S.

TBPE REG. NO. F-13016

STATE OF TEXAS
ISAEL POSADAS
89435
LICENSED
PROFESSIONAL ENGINEER

ELECTRONIC SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY ISAEL POSADAS, P.E. No. 89435 ON AUGUST 15, 2019. ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION OF THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

DATE: 8/15/19

SHEET NO.:
37 OF 37

ABBREVIATIONS

ABV	above
AFF	above finish floor
ASC	above suspended ceiling
ACC	access
ACFL	access floor
AP	access panel
AC	acoustical
ACPL	acoustical plaster
ACT	acoustical tile
ACR	acrylic plastic
ADD	addendum
ADH	adhesive
ADJ	adjacent
ADJT	adjustable
AGG	aggregate
A/C	air conditioning
ALT	alternate
AL	aluminum
ANC	anchor, anchorage
AB	anchor bolt
ANOD	anodized
APX	approximate
ARCH	architect (ural)
AD	area drain
ASB	asbestos
ASPH	asphalt
AT	asphalt tile
AUTO	automatic
BP	back plaster (ed)
BSMT	basement
BRG	bearing
BPL	bearing plate
BJT	bed joint
BM	bench mark
BEL	below
BET	between
BVL	beveled
BIT	bituminous
BLK	block
BLKG	blocking
BD	board
BW	both ways
BOT	bottom
BRK	brick
BRZ	bronze
BLDG	building
BUR	built up roofing
BBD	bulletin board
CAB	cabinet
CAD	cadmium
CPT	carpet (ed)
CSMT	casement
CI	cast iron
CIPC	cast-in-place concrete
CST	cast stone
CB	catch basin
CK	calk (ing) caulk (ing)
CLG	ceiling
CHT	ceiling height
CEM	cement
CPL	cement plaster (portland)
CM	centimeter (s)
CER	ceramic
CT	ceramic tile
CMT	ceramic mosaic (tile)
CKBD	chalkboard
CHAM	chamfer
CR	chromium (plated)
CIR	circle
CIRC	circumference
CLR	clear (ance)
CLS	closure
COL	column
COMB	combination
COMPT	compartment
COMPO	composition (composite)
COMP	compress (ed), (ion), (ible)
CONC	concrete
CMU	concrete masonry unit
CX	connection
CONST	construction
CONT	continuous or continue
CONTR	contract (or)
CLL	contract limit line
CJT	control joint
CPR	copper
CG	corner guard
CORR	corrugated
CTR	counter
CFL	counterflashing
CS	countersink
CTSK	countersunk screw
CRS	course (s)
CRG	cross grain
CFT	cubic foot
CYD	cubic yard
DPR	damper
DP	dampproofing
DL	dead load
DEM	demolish, demolition
DMT	demountable
DEP	depressed
DLT	detail
DIAG	diagonal
DIAM	diameter
DIM	dimension
DPR	dispenser
DIV	division
DR	door
DA	doubleacting
DH	double hung
DTA	dovetail anchor
DTS	dovetail anchor slot
DS	downspout
D	drain
DRB	drainboard
DT	drain tile
DWR	drawer
DWG	drawing
DF	drinking fountain
DW	dumbwaiter
EF	each face
E	east
ELEC	electric (al)
EP	electrical panelboard
EWC	electric water cooler
EL	elevation
ELEV	elevator
EMER	emergency
ENC	enclose (ure)
EQ	equal
EQP	equipment
ESC	escalator
EST	estimate
EXCA	excavate
EXH	exhaust
EXG	existing
EXMP	expanded metal plate
EB	expansion bolt
EXP	exposed
EXT	exterior
EXS	extra strong
FB	face brick
FOC	face of concrete
FOF	face of finish
FOM	face of masonry
FOS	face of studs
FF	factory finish
FAS	fasten fastener
FBD	fiberboard
FN	fence
FGL	fiberglase
FIN	finish (ed)
FFE	finished floor elevation
FFL	finished floor line
FA	fire alarm
FBRK	fire brick
FE	fire extinguisher
FEC	fire extinguisher cabinet
FHS	fire hose station
FPL	fireplace
FP	fireproof
FRC	fire-resistant coating
FRT	fire-retardant
FLG	flashing
FHMS	flathead machine screw
FHWS	flathead wood screw
FLX	flexible
FLR	floor (ing)
FLCO	floor cleanout
FD	floor drain
FPL	floor plate
FLUR	fluorescent
FJT	flush joint
FTG	footing
FRG	forged
FND	foundation
FR	frame (d), (ing)
FRA	fresh air
FS	full size
FBO	furnished by others
FUR	furred (ing)
FUT	future
GA	gage, gauge
GV	galvanized
GI	galvanized iron
GP	galvanized pipe
GSS	galvanized steel sheet
GKT	gasket (ed)
GC	general contract (or)
GL	glass, glazing
GLB	glass block
GLF	glass fiber
GCMU	glazed concrete masonry units
GST	glazed structural tile
GB	grab bar
GD	grade, grading
GRN	granite
GVL	gravel
GF	ground face
GT	grout
GPDW	gypsum dry wall
GPL	gypsum lath
GPPL	gypsum plaster
GPT	gypsum tile
HH	handhold
HBD	hardboard
HDW	hardware
HWD	hardwood
HJT	head joint
HDR	header
HTG	heating
HVAC	heating/ventilation/air conditioning
HD	heavy duty
HT	height
HX	hexagonal
HES	high early-strength
HC	hollow core
HM	hollow metal
HK	hook (s)
HOR	horizontal
HB	hose bibb
HWH	hot water heater
INCIN	incinerator
INCL	include (d), (ing)
ID	inside diameter
INS	insulate (d), (ion)
INSC	insulating concrete
INSF	insulating fill
INT	interior
ILK	interlock
INTM	intermediate
INV	invert
IPS	iron pipe size
JC	janitor's closet
JT	joint
JF	joint filler
J	joist
KCPL	keene's cement plaster
KPL	kickplate
KIT	kitchen
KO	knockout
LBL	label
LAB	laboratory
LAD	ladder
LB	lag bolt
LAM	laminate
LAV	lavatory
LH	left hand
L	length
LT	light
LC	light control
LP	lightproof
LW	lightweight
LWC	lightweight concrete
LMS	limestone
LTL	lintel
LL	live load
LVR	louver
LPT	low point
MB	machine bolt
MI	malleable iron
MH	manhole
MFR	manufacture (er)
MRB	marble
MFR	manufacture (er)
MAS	masonry
MO	masonry opening
MTL	material (s)
MAX	maximum
MECH	mechanic (al)
MC	medicine cabinet
MED	medium
MBR	member
MMB	membrane
MET	metal
MFD	metal floor decking
MTFR	metal furring
MRD	metal roof decking
MTHR	metal threshold
M	meter
MM	millimeter (s)
MWK	millwork
MIN	minimum
MIR	mirror
MISC	miscellaneous
MOD	modular
MLD	molding, moulding
MR	mop receptor
MT	mount (ed), (ing)
MOV	movable
MULL	mullion
NL	nailable
NAT	natural
NI	nickel
NR	noise reduction
NRC	noise reduction coefficient
NOM	nominal
NOM	nonmetallic
N	North
NIC	not in contract
NTS	not to scale
OBS	obscure
OC	on center (s)
OP	opaque
OPG	opening
OJ	open-web joist
OPP	opposite
OPH	opposite hand
OPS	opposite surface
OD	outside diameter
OHMS	ovalhead machine screw
OHWS	ovalhead wood screw
OA	overall
OH	overhead
PNT	paint (ed)
PNL	panel
PB	panic bar
PTD	paper towel dispenser
PTR	paper towel receptor
PAR	parallel
PK	parking
PBD	particle board
PTN	partition
PV	pave (d), (ing)
PVMT	pavement
PED	pedestal
PERF	perforate (d)
PERI	perimeter
PLAS	plaster
PLAM	plastic laminate
PL	plate
PG	plate glass
PWD	plywood
PT	point
PVC	polyvinyl chloride
PE	porcelain enamel
PTC	post-tensioned concrete
PCF	pounds per cubic foot
PFL	pounds per linear foot
PSF	pounds per square foot
PSI	pounds per square inch
PCC	precast concrete
PFB	prefabricate (d)
PFN	prefinished
PRF	preformed
PSC	prestressed concretee
PL	property line
QT	quarry tile
RBT	rabbet, rebate
RAD	radius
RL	rail (ing)
RWC	rainwater conductor
REF	reference
RFL	reflect (ed),(ive)(or)
REFR	refrigerator
REG	register
RE	reinforce (d), (ing)
RCP	reinforced concrete pipe
REM	remove
RES	resilient
RET	return
RA	return air
RVS	reverse (side)
REV	revision (s), revised
RH	right hand
ROW	right of way
R	riser
RVT	rivet
RD	roof drain
RFH	roof hatch
RM	room
RO	rough opening
RB	rubber base
RBT	rubber tile
RBL	rubber stone
SFGL	safety glass
SCH	schedule
SCN	screen
SNT	sealant
STG	seating
SEC	section
SSK	service sink
SHTH	sheating
SHT	sheet
SG	sheet glass
SH	shelf, shelving
SHO	shore (d), (ing)
SIM	similar
SKL	skylight
SL	sleeve
SC	solid core
SP	sound proof
S	south
SPC	spacer
SPK	speaker
SPL	special
SPEC	specification(s)
SQ	square
SST	stainless steel
STD	standard
STA	station
ST	steel
STO	storage
SD	storm drain
STR	structural
SCT	structural clay tile
SUS	suspended
SYM	symmetry (ical)
SYN	synthetic
SYS	system
TKBD	tackboard
TKS	tackstrip
TEI	telephone
TV	television
TC	terra cotta
TZ	terrazo
THK	thick (ness)
THR	threshold
TPTN	toilet partition
TPD	toilet paper dispenser
TOL	tolerance
T&G	tongue and groove
TSL	top of slab
TST	top of steel
TW	top of wall
TB	towel bar
TR	transom
T	tred opening
TYP	typical
UC	undercut
UNF	unfinished
UR	urinal
VJ	v-joint
VB	vapor barrier
VAR	varnish
VNR	veneer
VRM	vermiculite
VERT	vertical
VG	vertical grain
VIN	vinyl
VAT	vinyl asbestos tile
VB	vinyl base
VF	vinyl fabric
VT	vinyl tile
WSCT	wainscot
WTW	wall to wall
WH	wall hung
WC	water closet
WP	waterproofing
WR	water repellent
WS	waterstop
WWF	welded wire fabric
W	west
WHB	wheel bumper
W	width, wide
WIN	window
WG	wired glass
WM	wire mesh
WO	without
WD	wood
WB	wood base
WPT	working point
WI	wrought iron

MATERIALS LEGEND

- CONTINUOUS WOOD BLOCKING
- NON-CONTINUOUS WOOD BLOCKING (SHIM)
- STEEL
- GYPSUM BOARD
- PLYWOOD
- RIGID INSULATION
- BATT INSULATION
- CONCRETE MASONRY UNITS

SYMBOLS

- X/AX.X — ELEVATION SYMBOL
- X/AX.X — SECTION/DETAIL SYMBOL
- (X) — WALL TYPE SYMBOL
- (X) — WINDOW SYMBOL
- ROOM NAME / RM # / FIN # — ROOM NAME & NUMBER SYMBOL, FINISH NUMBER
- (XX) — DOOR SYMBOL

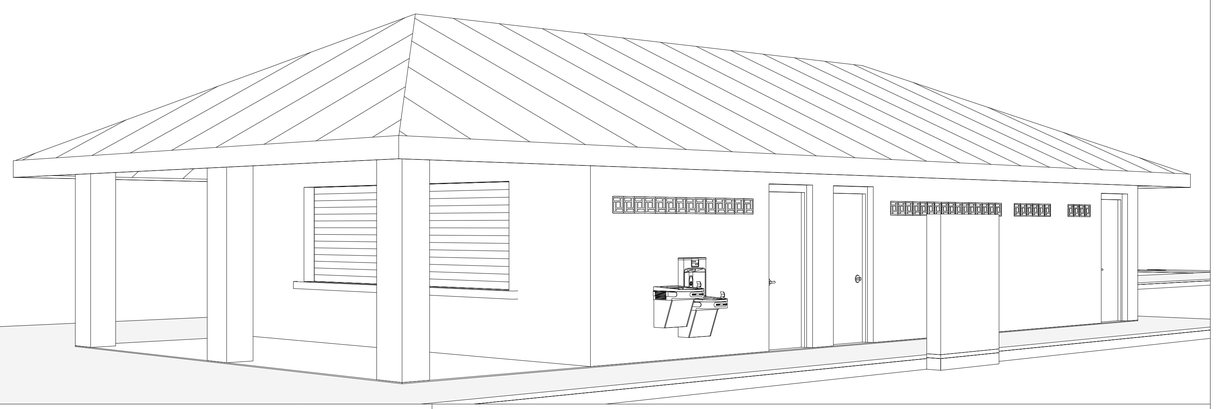
PARKING REQUIREMENTS

GENERAL NOTES

1. ALL CONSTRUCTION INCLUDING MATERIAL AND WORKMANSHIP, SHALL CONFORM TO THE 2012 INTERNATIONAL BUILDING CODE.
2. ALL ASTM STANDARDS LISTED HERE WITHIN, SHALL BE AS REFERENCED IN THE LATEST ISSUE OF THE ANNUAL BOOK OF STANDARDS OF THE AMERICAN SOCIETY FOR TESTING AND MATERIALS
3. THE CONTRACTOR, SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS AND SITE CONDITIONS BEFORE BEGINNING WORK. THE ARCHITECT AND ENGINEER, SHALL IMMEDIATELY BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.
   THE CONTRACTOR SHALL CAREFULLY STUDY AND COORDINATE THE MECHANICAL, PLUMBING, AND ELECTRICAL SYSTEMS WITH THE ARCHITECTURAL WORK PRIOR TO INSTALLATION AND SHALL NOTIFY THE ARCHITECT IN WRITING OF ALL APPARENT INCONSISTENCIES FOR CLARIFICATION.
4. ALL OMISSIONS AND OR CONFLICTS BETWEEN THE VARIOUS ELEMENTS OF THE WORKING DRAWINGS AND SPECIFICATIONS, SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT OR ENGINEER. WORK SHOULD NOT PROCEED UNTIL A SOLUTION IS GIVEN BY THE ARCHITECT OR ENGINEER.
5. IN CASE OF CONFLICTS BETWEEN GENERAL NOTES AND DETAILS, THE DETAILS, SHALL TAKE PRECEDENCE OVER THE GENERAL NOTES. TYPICAL DETAILS, SHALL BE USED WHENEVER APPLICABLE. REFER TO SPECIFICATIONS FOR INFORMATION NOT COVERED BY THESE NOTES OR DRAWINGS.
6. IF A SPECIFIC DETAIL IS NOT SHOWN FOR ANY PART OF WORK, THE CONSTRUCTION, SHALL BE THE SAME AS FOR SIMILAR WORK.
7. COORDINATE FOUNDATION PLANS AND MECHANICAL DRAWINGS, FOR ALL OPENINGS, INSERTS AND OTHER RELATED ITEMS.
8. DIMENSIONS ARE TO FINISH FACE OF WALLS UNLESS NOTED OTHERWISE.
9. ADDITIONAL MISCELLANEOUS STEEL ITEMS NOT SHOWN ON STRUCTURAL DRAWINGS MAY BE REQUIRED. GENERAL CONTRACTOR AND FABRICATOR SHALL COORDINATE ALL REQUIREMENTS AND SHALL NOTIFY THE ARCHITECT IN WRITING OF ALL APPARENT INCONSISTENCIES FOR CLARIFICATION. (SUCH AS SIMPSON STRONG TIES)
10. DO NOT DIMENSION THIS DRAWING. ANY DIMENSIONS, QUESTIONS, SHOULD BE DIRECTED TO THE ARCHITECT OR ENGINEER.

INDEX OF DRAWINGS

EEDC NORTH PARK RESTROOM



PROJECT CONTACTS

ARCHITECT:
RUDY MOLINA, A.I.A.
MILNET ARCHITECTURAL SERVICES
608 S. 12th STREET
Mc ALLEN. TEXAS 78501
(956) 688-5656

SITE PLAN/LOCATION MAP

MILNET
ARCHITECTURAL
SERVICES
AMERICAN INSTITUTE OF ARCHITECTS

REGISTERED ARCHITECT
RODOLFO R. MOLINA JR.
14740
STATE OF TEXAS

EEDC NORTH PARK RESTROOM

SDI ENGINEERING
PROJECT LOCATION

PROJECT NUMBER
219018

DATE
8/14/2019

ISSUED FOR BIDS

SHEET NUMBER
A0.0

TOILET ACCESSORIES LEGEND

A	STAINLESS STL GRAB BAR 36" LONG	B-6206-36
B	STAINLESS STL GRAB BAR 42" LONG	B-6206-42
C	NOT USED	
D	NOT USED	
E	NOT USED	
F	RECESSED MOUNTED STAINLESS STEEL ADULT CHANGE TABLE. FOUNDATIONS.	100SSE-R
G	ALUM. FRAMED TEMPERED GLASS MIRROR 18" x 36"	B-290-1836
H	NOT USED	
I	NOT USED	
J	NOT USED	
K	NOT USED	
L	NOT USED	
M	NOT USED	
N	RECESSED MOUNTED AUTOMATIC HAND DRYER	B-750
O	NOT USED	
P	NOT USED	
Q	NOT USED	
R	NOT USED	
S	NOT USED	
T	NOT USED	
U	SURFACE MOUNTED SOAP DISPENSER KIMBERLY CLARK	# 92144
V	SURFACE MOUNTED TWO-ROLL TISSUE DISPENSER BOBRICK	B-265

TOILET ACCESSORIES NOTES

1. PROVIDE ALL NECESSARY ANCHORING PLATES AND FASTENERS.
2. PROVIDE EXPANSION SHIELDS FOR CMU PTN OR ANCHORING PLATE AND TOGGLE BOLTS AT GYP BD WALL CONDITIONS FOR SECURE ATTCHMENT.
3. COORDINATE WITH WALL PTN CONSTRUCTION FOR RECESSED ACCESSORY.
4. COLOR TO BE SELECTED BY OWNER FROM MANUFACTURERS STANDARD COLORS.
5. COORDINATE ELECTRICAL REQUIREMENTS AND ANCHORING.
6. COORDINATE LOCATION WITH OTHER ACCESSORIES ON WALL.
7. UNIT SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR AS PART OF BASE BID.
   - SOAP DISPENSERS
   - TISSUE DISPENSERS
   - TOWEL PIN
   - HAND DRYERS
   - SHOWER CURTAINS & HOOKS
   - GRAB BARS
   - MIRRORS
   - RECESSED SOAP DISH
8. RE: A3.0 FOR MOUNTING HEIGHTS

GENERAL NOTES

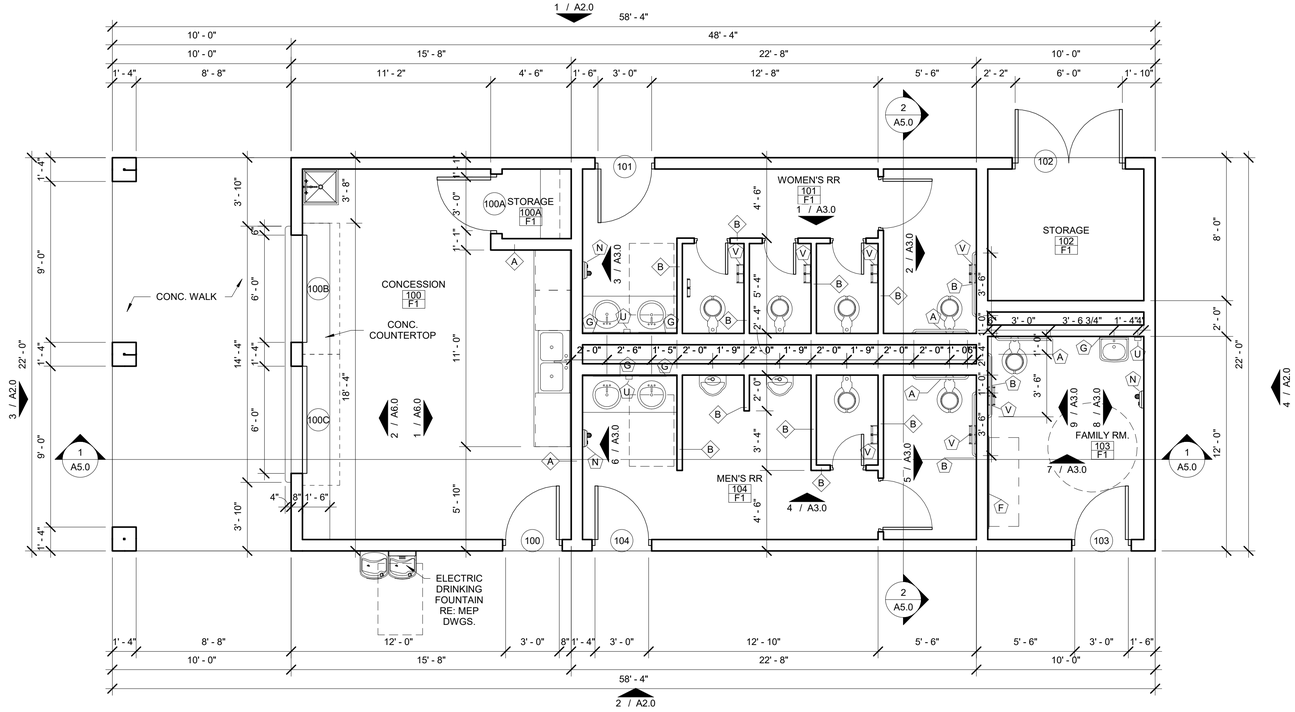
1. GENERAL CONTRACTOR SHALL VISIT SITE AND FAMILIARIZE WITH ALL EXISTING CONDITIONS AND CONTRACT DOCUMENTS. CONTRACTOR SHALL REPORT TO THE ARCHITECT ANY DISCREPANCIES OR IRREGULARITIES THAT MAY EXIST PRIOR TO SUBMITTING A BID.
2. GENERAL CONTRACTOR SHALL REMOVE ALL DEBRIS AND CONSTRUCTION MATERIAL OFF OF SITE AND DISPOSE ON APPROPRIATE DUMPSITE.
3. IT IS THE CONTRACTORS RESPONSIBILITY TO FIELD VERIFY EXISTING CONDITIONS, DIMENSIONS, QUANTITIES, ETC. PRIOR TO BIDDING.
4. PAINT ALL WALLS WHERE NEW CONSTRUCTION HAS OCCURRED
5. FURNISH & INSTALL STAINLESS STEEL MOP & BROOM HOLDER IN ROOM No. 106

GENERAL NOTES:

1. ALL PENETRATIONS IN TOP OR BOTTOM PLATES FOR PLUMBING OR ELECTRICAL RUNS TO BE SEALED. SEE ELECTRICAL PLANS FOR ADDITIONAL SPECIFICATIONS.
2. ALL DIM. TO FINISH FACE OF WALL.
3. BUILDING MUST HAVE A PANEL BOX (LOCATION AS PER CITY CODES).
4. ALL SMOKE DETECTORS ARE TO BE PLACED AS PER CITY CODES.
5. ALL LIGHT FIXTURES TO BE REVIEWED BY OWNER. RE: ELEC.
6. RE: A7.0 FOR DOOR, WINDOW SCH.
7. RE: 2/A1.0 FOR PARTITION TYPES.
8. ROOM NO. FINISH NO.
9. ALL PARTITIONS TYPE "A" U.N.O.
10. PROVIDE ROOM SIGNAGE, RE: 3/A9.0
11. BULLNOSE EDGE AT ALL C.M.U. CORNERS FOR INTERIOR C.M.U. WALLS.

BUILDING GROSS AREA

NEW BUILDING:	1,063 SQ. FT.
COVERED PATIO:	220 SQ. FT.
TOTAL:	1,283 SQ. FT.



1 FIRST FLOOR PLAN
1/4" = 1'-0"

MILNET ARCHITECTURAL SERVICES
AMERICAN INSTITUTE OF ARCHITECTS
REGISTERED ARCHITECT
STATE OF TEXAS

EEDC NORTH PARK RESTROOM

SDI ENGINEERING

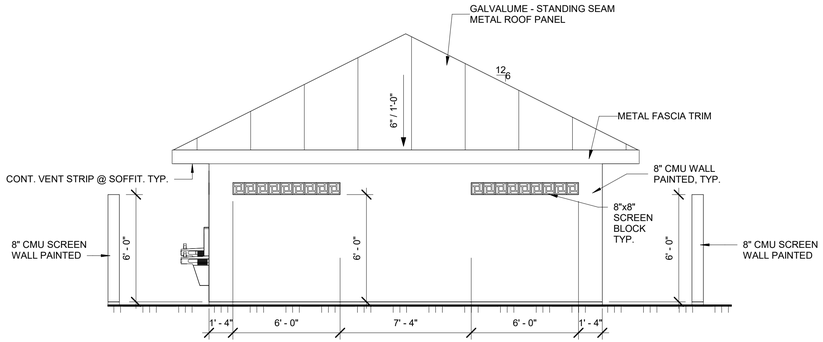
PROJECT LOCATION

PROJECT NUMBER
219018

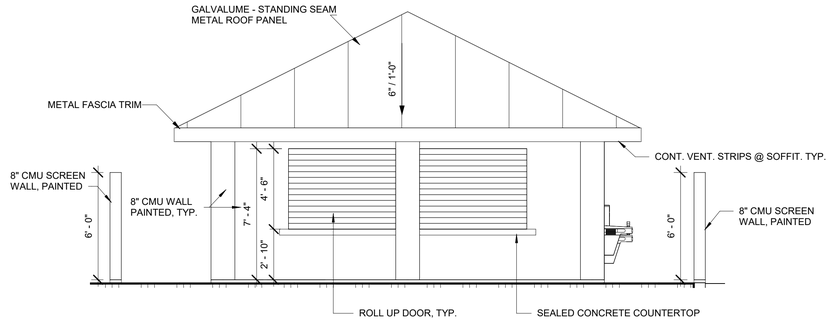
DATE
8/14/2019

ISSUED FOR BIDS

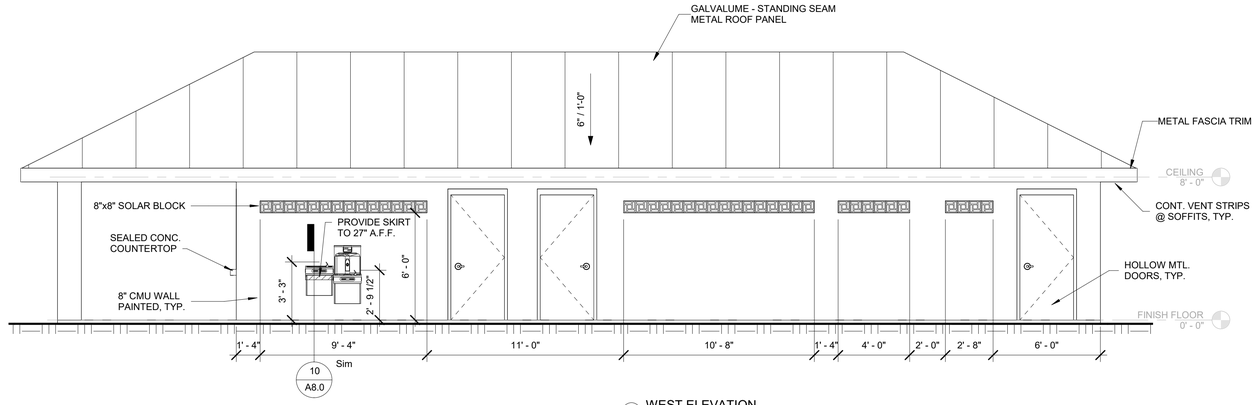
SHEET NUMBER
A1.0



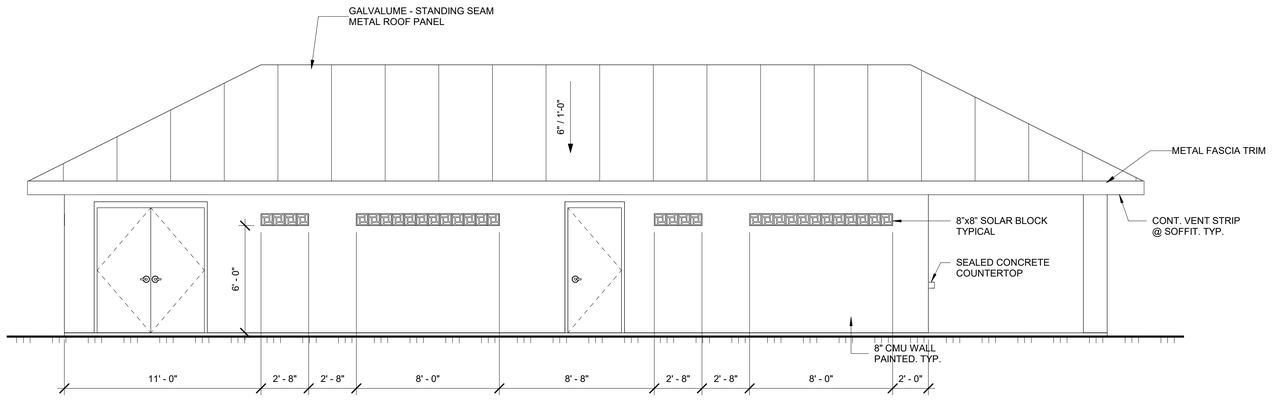
4 SOUTH ELEVATION
1/4" = 1'-0"



3 NORTH ELEVATION
1/4" = 1'-0"



2 WEST ELEVATION
1/4" = 1'-0"



1 EAST ELEVATION
1/4" = 1'-0"

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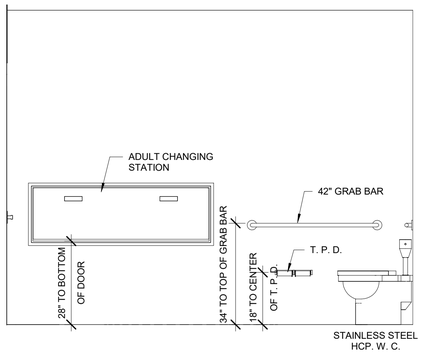
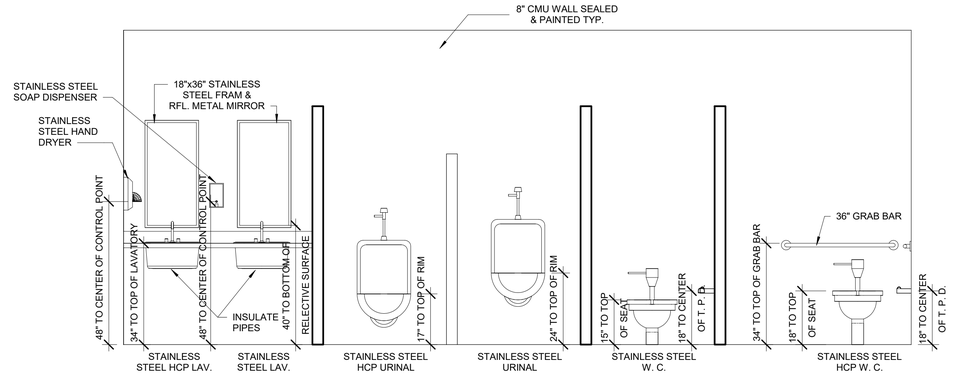
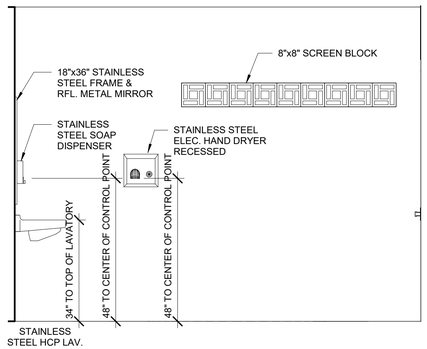


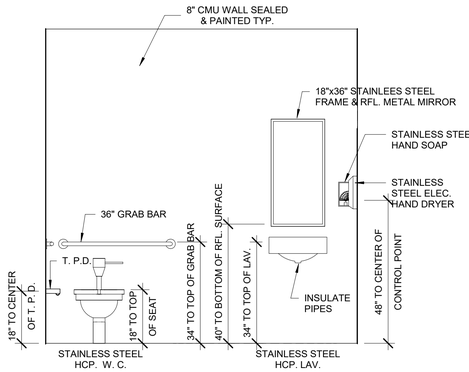
9 INTERIOR ELEVATION
1/2" = 1'-0"



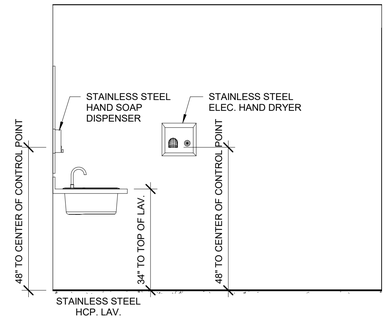
4 INTERIOR ELEVATION
1/2" = 1'-0"



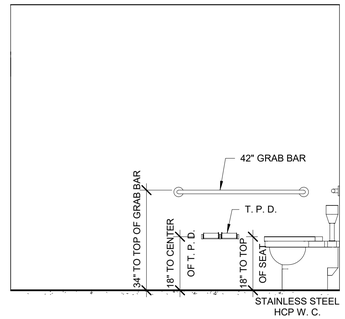
8 INTERIOR ELEVATION
1/2" = 1'-0"



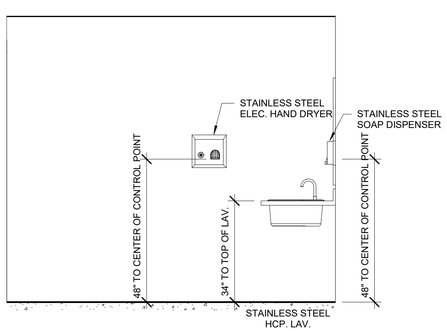
7 INTERIOR ELEVATION
1/2" = 1'-0"



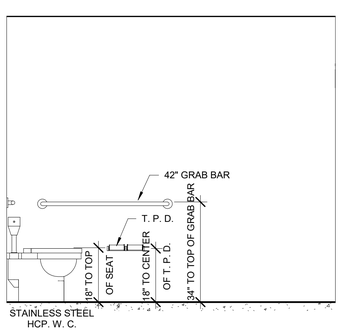
3 INTERIOR ELEVATION
1/2" = 1'-0"



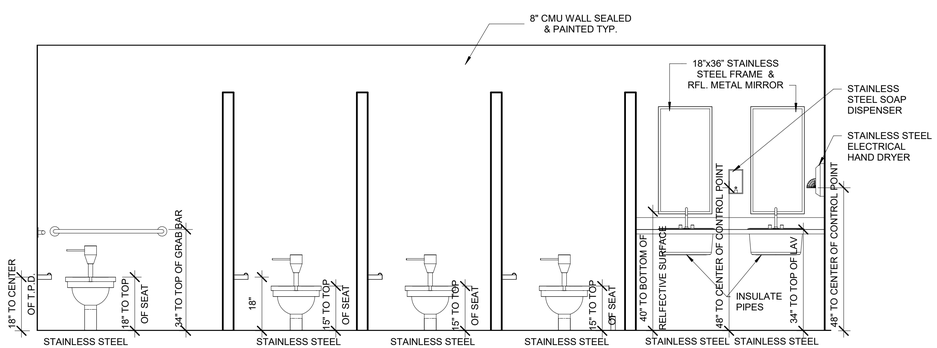
2 INTERIOR ELEVATION
1/2" = 1'-0"



6 INTERIOR ELEVATION
1/2" = 1'-0"



5 INTERIOR ELEVATION
1/2" = 1'-0"



1 INTERIOR ELEVATION
1/2" = 1'-0"

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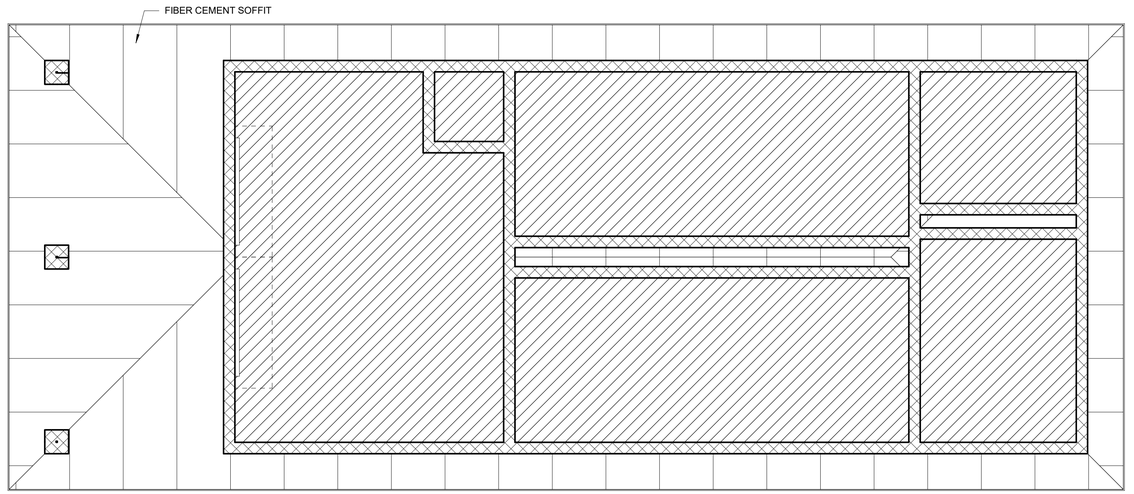
GENERAL NOTES:

1. REFER TO MEP DRAWINGS FOR EXACT LIGHTING COUNT AND LOCATIONS.
2. PROVIDE A 24 x 24 ACCESS PANEL AT RESTROOMS.
3. ALL CEILINGS ARE 8'-7" A.F.F. UNLESS NOTED OTHERWISE.

LEGEND:

FIBER CEMENT BD.



1 REFLECTED CEILING PLAN
1/4" = 1'-0"

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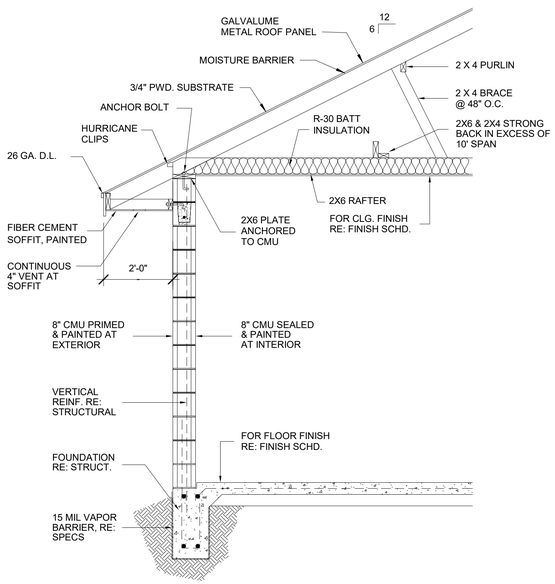
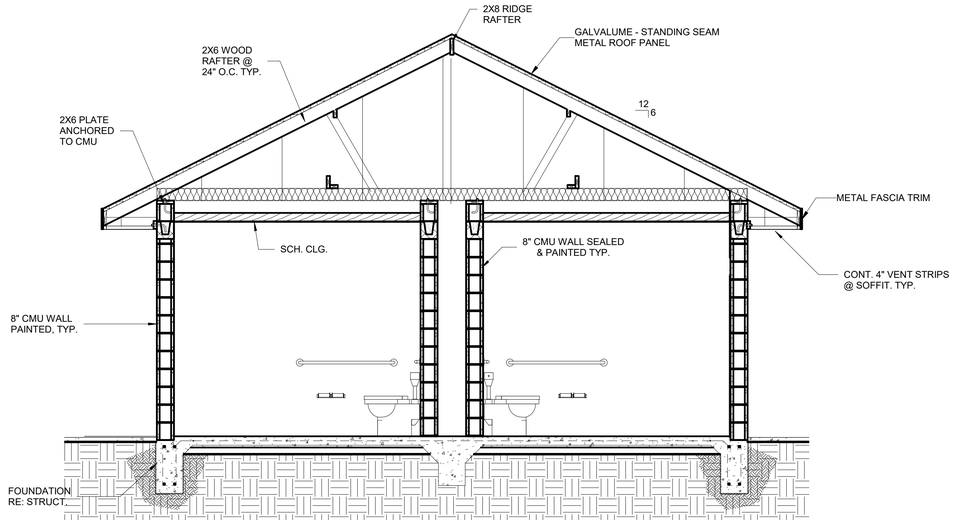
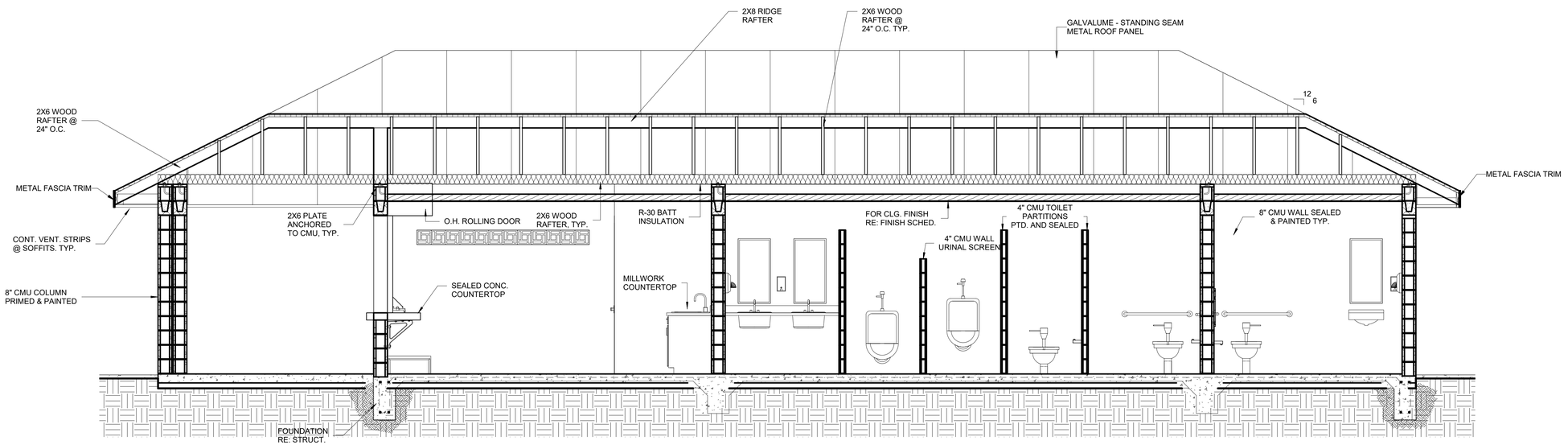


3 WALL SECTION
1/2" = 1'-0"



2 BUILDING SECTION
3/8" = 1'-0"



1 BUILDING SECTION
3/8" = 1'-0"

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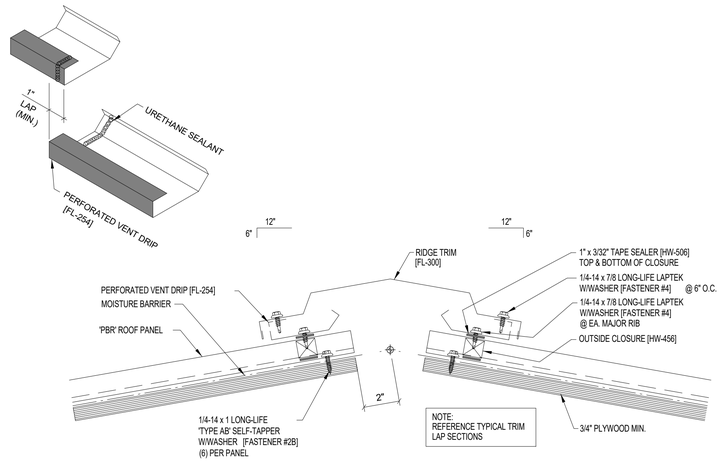
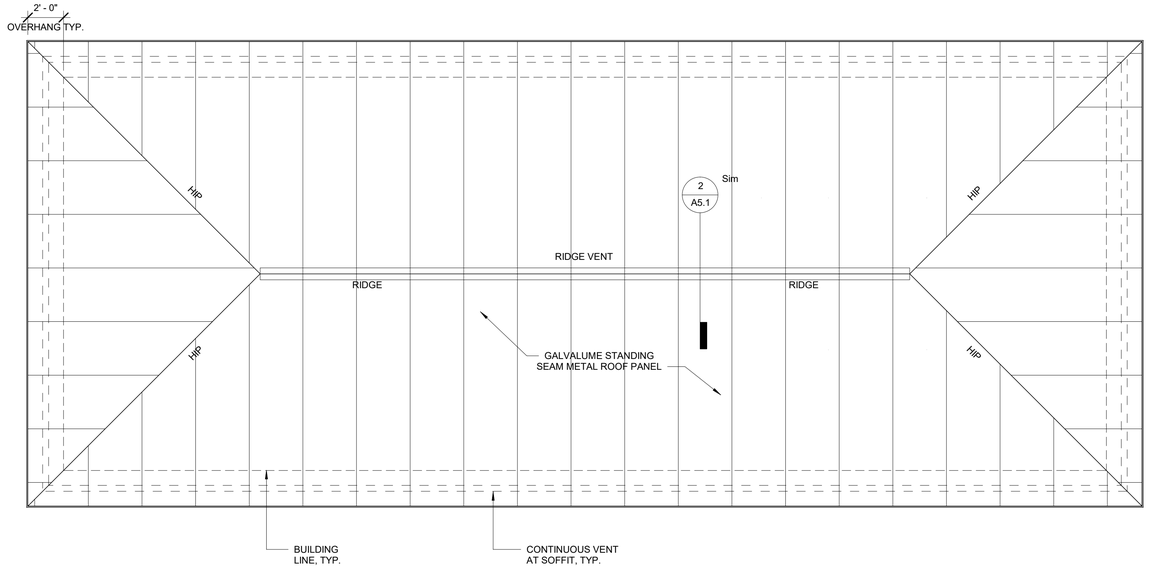


2 RIDGE VENT
3" = 1'-0"



1 ROOF PLAN
1/4" = 1'-0"

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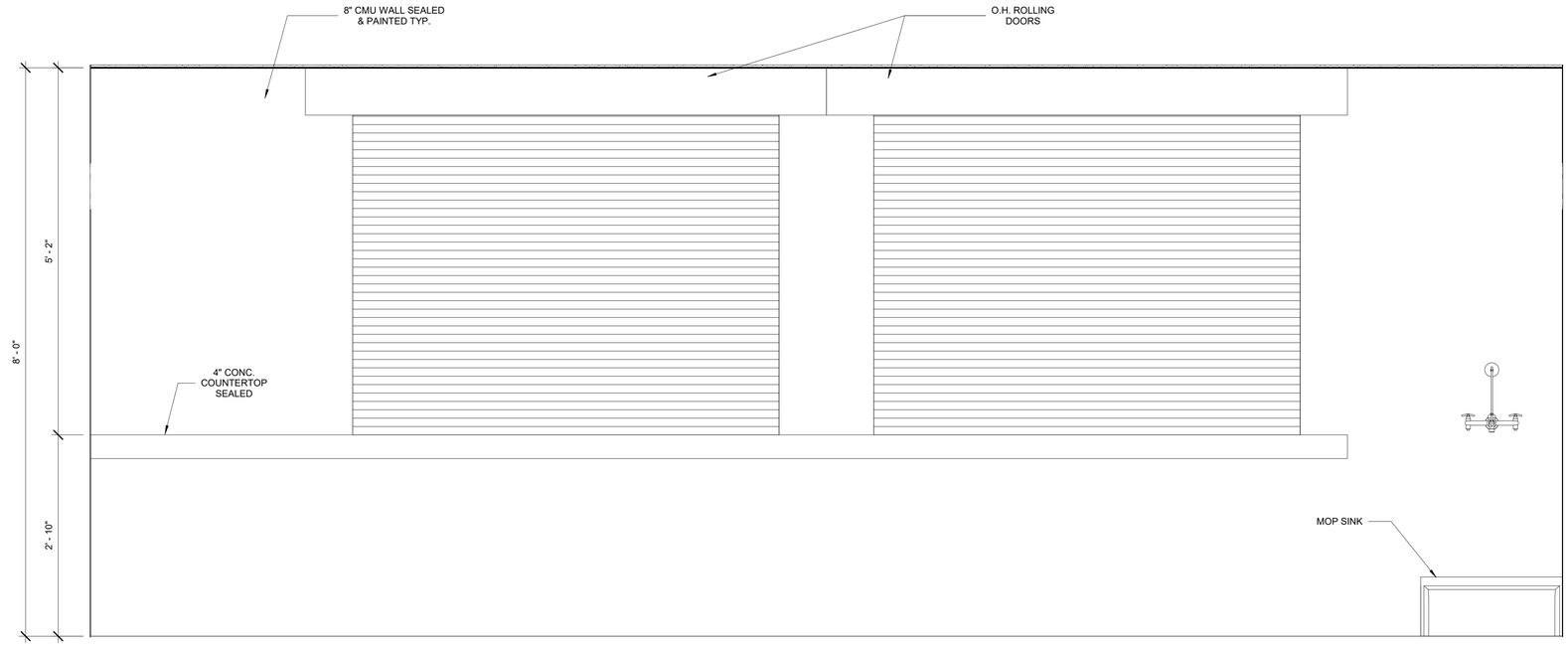
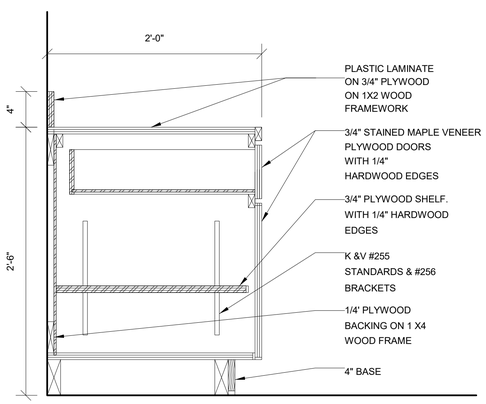
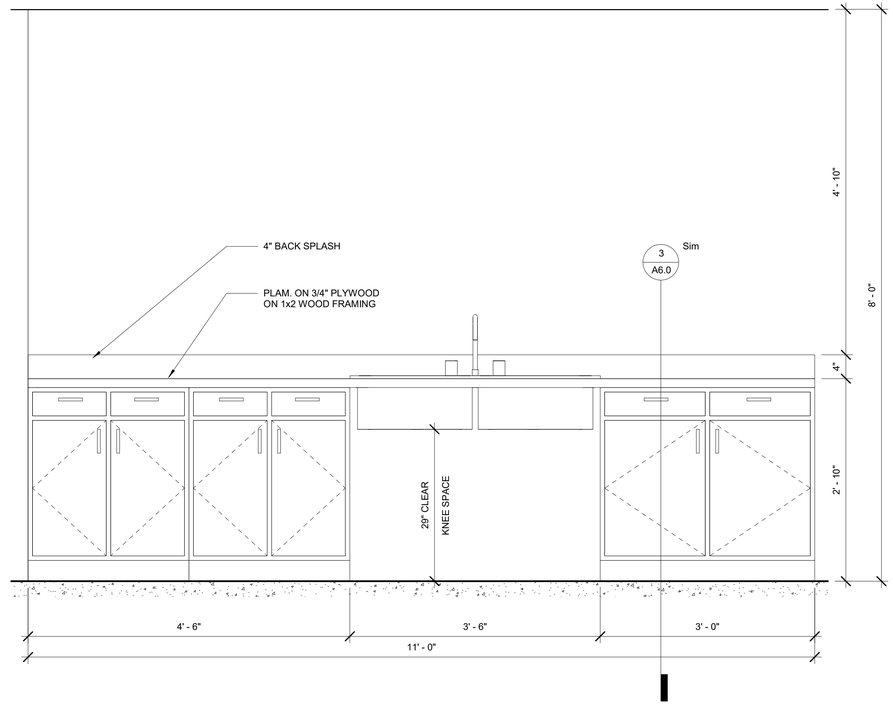
SHEET NUMBER
A5.1



2 INTERIOR ELEVATION
1" = 1'-0"



3 MILLWORK SECTION
1 1/2" = 1'-0"



1 INTERIOR ELEVATION
1" = 1'-0"

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DOOR SCHEDULE

MARK	DESCRIPTION	DOOR TYPE	WIDTH	HEIGHT	THICKNESS	FRAME MATERIAL	FINISH	FRAME TYPE	HEAD DETAIL	JAMB DETAIL	SILL DETAIL	Comments
100	CONCESSION	A	3' - 0"	7' - 0"	0' - 2"	HOLLOW MTL. PTD.	HOLLOW MTL. PTD.	A	3/A7.0	2/A7.0	1/A7.0	
100A	CONCESSION	A	3' - 0"	7' - 0"	0' - 2"	HOLLOW MTL. PTD.	HOLLOW MTL. PTD.	A	3/A7.0	2/A7.0	1/A7.0	
100B	CONCESSION	C	6' - 0"	4' - 0"	0' - 2"	ALUMINUM	ALUMINUM	--	6/A7.0	5/A7.0	4/A7.0	MANUAL ROLLING DOOR WITH CHAIN LOCK
100C	CONCESSION	C	6' - 0"	4' - 0"	0' - 2"	ALUMINUM	ALUMINUM	--	6/A7.0	5/A7.0	4/A7.0	MANUAL ROLLING DOOR WITH CHAIN LOCK
101	WOMEN'S RR	A	3' - 0"	7' - 0"	0' - 2"	HOLLOW MTL. PTD.	HOLLOW MTL. PTD.	A	3/A7.0	2/A7.0	1/A7.0	
102	STORAGE	B	6' - 0"	7' - 0"	0' - 2"	HOLLOW MTL. PTD.	HOLLOW MTL. PTD.	B	3/A7.0	2/A7.0	1/A7.0	
103	FAMILY RR	A	3' - 0"	7' - 0"	0' - 2"	HOLLOW MTL. PTD.	HOLLOW MTL. PTD.	A	3/A7.0	2/A7.0	1/A7.0	
104	MEN'S RR	A	3' - 0"	7' - 0"	0' - 2"	HOLLOW MTL. PTD.	HOLLOW MTL. PTD.	A	3/A7.0	2/A7.0	1/A7.0	

ROOM SCHEDULE

Number	Name	FINISH KEY NOTE	WALLS	BASE	FLOOR	CEILING	Comments
100	CONCESSION	F1	P-1	B-1	SC	FC-1	
100A	STORAGE	F1	P-1	B-1	SC	FC-1	
101	WOMEN'S RR	F1	P-1	B-1	SC	FC-1	
102	STORAGE	F1	P-1	B-1	SC	FC-1	
103	FAMILY RM.	F1	P-1	B-1	SC	FC-1	
104	MEN'S RR	F1	P-1	B-1	SC	FC-1	

ROOM FINISH STANDARDS

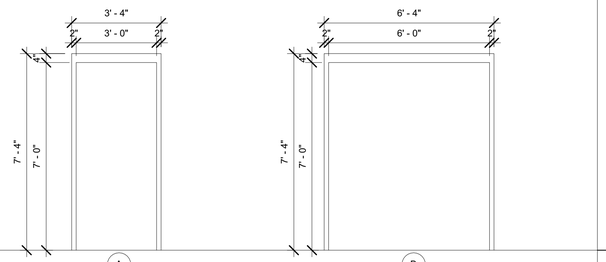
WALLS
- P-1 CMU SEALED & PAINTED (LATEX PAINT)

FLOOR COVERINGS
- SC SEALED CONCRETE

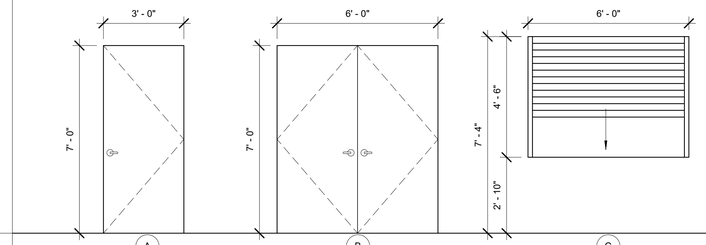
BASE

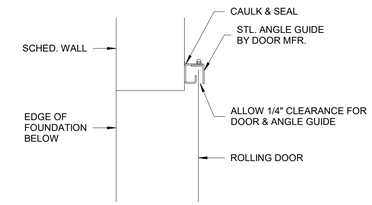
CEILING
- FC-1 FIBER CEMENT BOARD PAINTED

DOOR FRAME TYPES

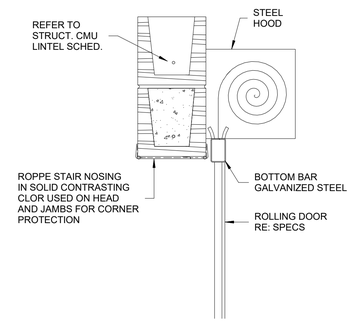


DOOR TYPES

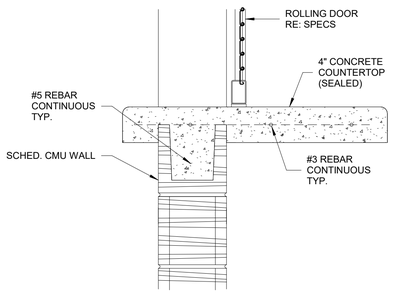




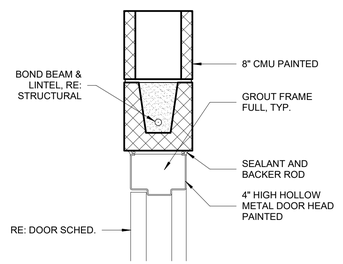
6 OH ROLLING DOOR - JAMB DETAIL
1 1/2" = 1'-0"



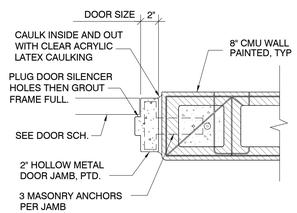
5 O.H. ROLLING DOOR - HEAD DETAIL
1 1/2" = 1'-0"



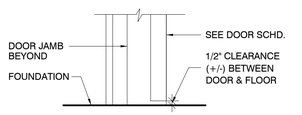
4 OH ROLLING DOOR - SILL DETAIL
1 1/2" = 1'-0"



3 CMU - HEAD DETAIL
1 1/2" = 1'-0"



2 CMU - JAMB DETAIL
1 1/2" = 1'-0"



1 CMU - SILL DETAIL
1 1/2" = 1'-0"

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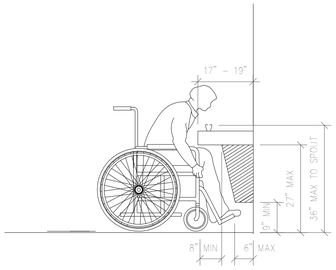
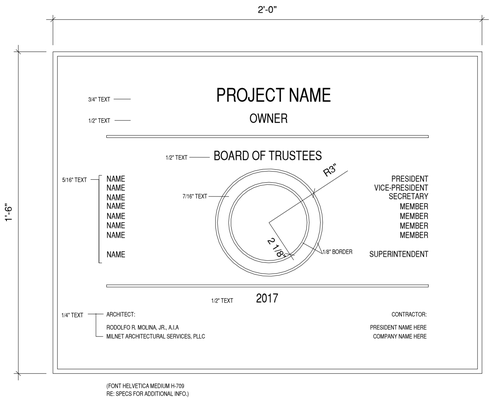
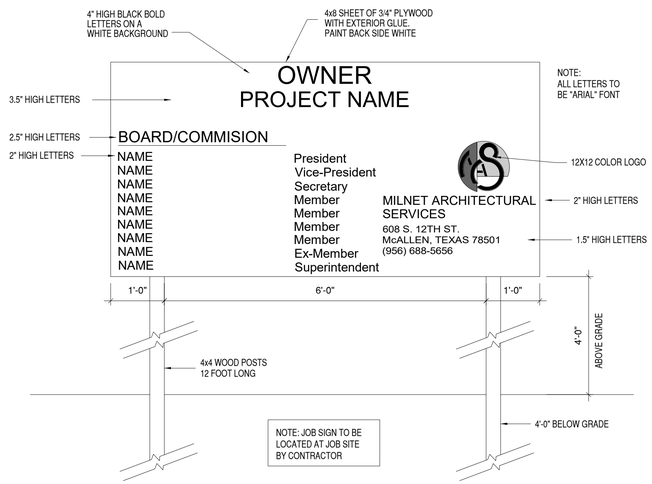


10 DRINKING FOUNTAIN SECTION
1/2" = 1'-0"

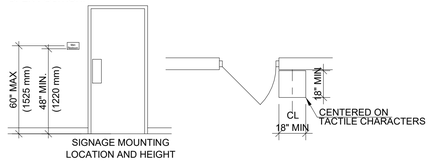


5 PLAQUE
N.T.S.

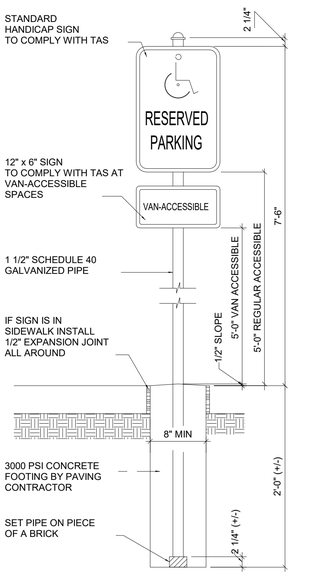


4 JOB SITE SIGN
N.T.S.

1. COLOR AS CLOSE TO COUNTERTOP AS POSSIBLE BASED ON STANDARD COLORS.
2. SIGNS THAT DESIGNATE PERMANENT ROOMS AND SPACES MUST COMPLY WITH REQUIREMENTS FOR CHARACTER PROPORTION, RAISED ADN BRAILLED CHARACTERS AND PICTORIAL SYMBOLS SIGNS, FINISH AND CONTRAST, AND MOUNTING AND LOCATION HEIGHT.
3. CHARACTER PROPORTION: CHARACTERS SHALL BE SELECTED FROM FONTS WHERE THE WIDTH OF THE UPPERCASE LETTER "O" IS 55 PERCENT MINIMUM AND 110 PERCENT MAXIMUM OF THE HEIGHT OF THE UPPERCASE LETTER "I".
4. RAISED AND BRAILLED CHARACTERS AND PICTORIAL SYMBOL SIGNS (PICTORGRAMS): LETTERS AND NUMERALS SHALL BE RAISED 1/32 IN, UPPER-CASE, SANS SERIF AND SHALL BE ACCOMPANIED WITH GRADE 2 BRAILLE. RAISED CHARACTERS SHALL BE AT LEAST 5/8 IN. (16mm) HIGH, BUT NO HIGHER THAN 2 IN. (50mm). PICTOGRAMS SHALL BE ACCOMPANIED BY THE EQUIVALENT VERBAL DESCRIPTION PLACED DIRECTLY BELOW THE PICTOGRAM. THE BORDER DIMENSION OF THE PICTOGRAM SHALL BE 6 IN. (152mm) MINIMUM IN HEIGTH.
5. FINISH AND CONTRAST: CHARACTERS AND THEIR BACKGROUND SHALL HAVE A NON-GLARE FINISH. CHARACTERS SHALL CONTRAST WITH THEIR BACKGROUND WITH EITHER LIGHT CHARACTERS ON A DARK BACKGROUND OR DARK CHARACTERS ON A LIGHT BACKGROUND.
6. MOUNTING LOCATION AND HEIGHT. WHERE PERMANENT IDENTIFICATION IS PROVIDED FOR ROOMS AND SPACES, SIGNS SHALL BE INSTALLED ALONGSIDE DOOR AT THE LATCH SIDE. WHERE A TACTILE SIGN IS PROVIDED AT DOUBLE DOORS WITH ONE ACTIVE LEAF, THE SIGN SHALL BE INSTALLED ON THE INACTIVE LEAF. WHERE A TACTILE SIGN IS PROVIDED AT DOUBLE DOORS WITH TWO ACTIVE LEAFS, THE SIGN SHALL BE INSTALLED TO THE RIGHT OF THE RIGHT HAND DOOR. WHERE THERE IS NO WALL SPACE AT THE LATCH SIDE OF A SINGLE DOOR OR AT THE RIGHT SIDE OF DOUBLE DOORS, SIGND SHALL BE LOCATED ON THE NEAREST ADJACENT WALL. SIGNS CONTAINING TACTILE CHARACTERS SHALL BE LOCATED SO THAT A CLEAR FLOOR SPACE OF 18" MIN. BY 18" MIN., CENTERED ON THE TACTILE CHARACTERS, IS PROVIDED BEYOND THE ARC OF ANY DOOR SWING BETWEEN THE CLOSED POSITION AND 45 DEGREE OPEN POSITION.



3 ADA - INTERIOR SIGNAGE SPECS
N.T.S.



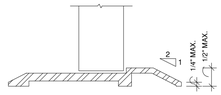
2 ADA - PARKING SIGNAGE
N.T.S.

DOOR CRITERIA:

GENERAL NOTES:

1. FLOOR OR GROUND SURFACE. FLOOR OR GROUND SURFACE WITHIN REQUIRED MANEUVERING CLEARANCE SHALL BE STABLE FIRM, AND SLIP RESISTANT. CHANGES IN LEVEL ARE NOT PERMITTED.

2. VISION LIGHTS. DOORS, GATES, AND SIDE LIGHTS ADJACENT TO DOOR OR GATES, SHALL HAVE THE BOTTOM OF AT LEAST ONE GLAZED PANEL LOCATED 43" MAX. ABOVE THE FINISH FLOOR



A. THRESHOLD

NOTES:

1. 1/2" MAXIMUM TOTAL HEIGHT WITH 1/4" MAXIMUM VERTICAL CHANGE AT EDGE.

2. 1 : 2 SLOPED BEVEL REQUIRED IF LEVEL CHANGE IS OVER 1/4" VERTICAL LEVEL CHANGE.

DOOR TYPE:

1. MINIMUM 10" HIGH SMOOTH SURFACE AT DOOR BOTTOM, EITHER ATTACHED PANEL OR BOTTOM RAIL.

HARDWARE:

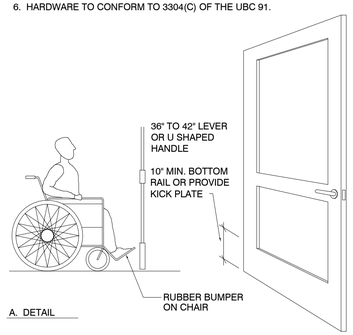
2. OPERABLE FROM INSIDE WITHOUT USE OF KEY OR SPECIAL KNOWLEDGE OR EFFORT.

3. OPENABLE BY SINGLE EFFORT LEVER-TYPE DEVICE (NOT REQUIRING GRASPING).

4. MOUNTED 36" TO 42".

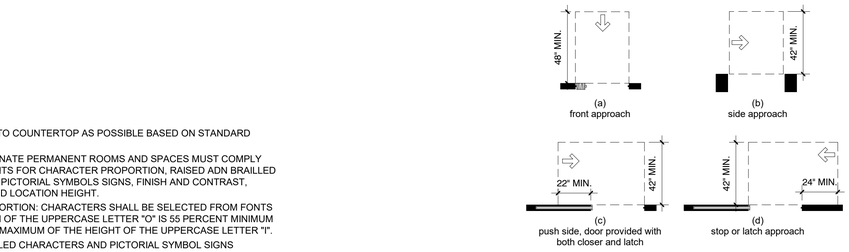
5. MAXIMUM 8.5 POUNDS EFFORT TO OPERATE EXTERIOR DOOR, 5 POUNDS FOR INTERIOR.

6. HARDWARE TO CONFORM TO 3304(C) OF THE UBC 91.

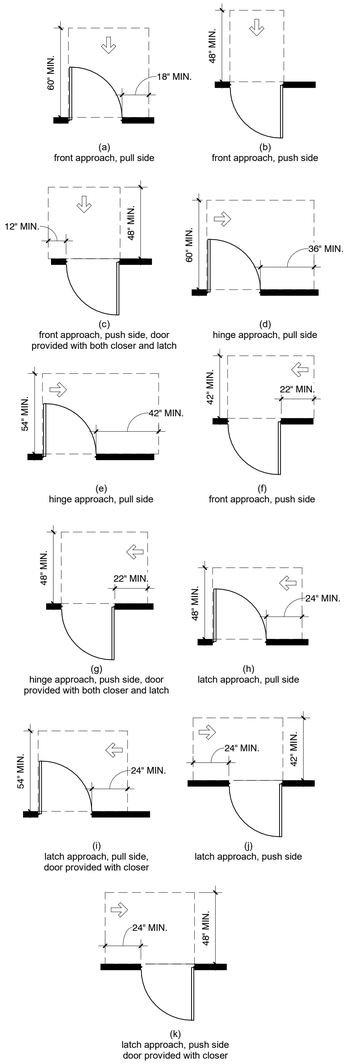


A. DETAIL

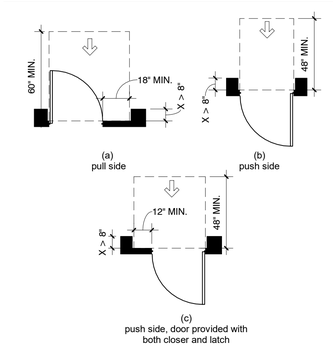
1 DOOR CRITERIA
N.T.S.



MANEUVERING CLEARANCE AT DOORWAYS WITHOUT DOORS, SLIDING DOORS, GATES AND FOLDING DOORS



MANEUVERING CLEARANCE AT MANUAL SWINGING DOORS AND GATES



MANEUVERING CLEARANCE AT RECESSED DOORS AND GATES

MILNET
ARCHITECTURAL
SERVICES
AMERICAN INSTITUTE OF ARCHITECTS

REGISTERED ARCHITECT
STATE OF TEXAS

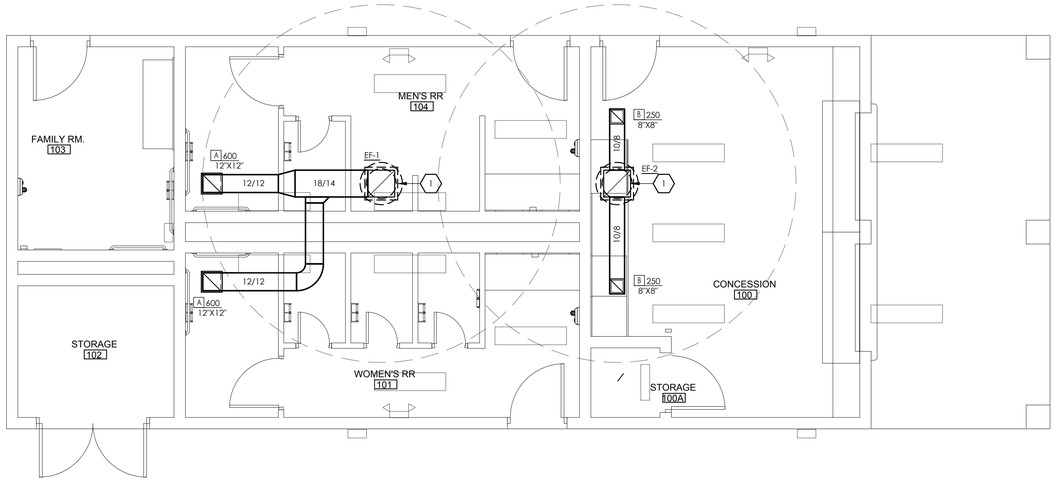
EEDC NORTH PARK RESTROOM
SDI ENGINEERING
PROJECT LOCATION

PROJECT NUMBER
219018

DATE
8/14/2019

ISSUED FOR BIDS

SHEET NUMBER
A8.0



1 MECHANICAL CONCESSION PLAN

SCALE: 1/4"=1'-0"

KEYED NOTES: MECHANICAL

1. EXHAUST DUCT UP TO ROOF MOUNTED EXHAUST FAN.

1'
5'
10'

TRUE SCALE

TRINITY
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3533 Moreland Dr. Ste A I Weslaco, Tx 78596
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Texas Registered Engineering Firm - F10362
Project number: T:\2019\19.2.30\DWGs\19.2.30 MECH.dwg

08/14/19

STATE OF TEXAS
Wilford L. McGee III
121939
PROFESSIONAL ENGINEER

FILE NAME:
DATE: 7/3/19
SURVEYED BY:
DESIGNED BY: IF
DRAWN BY: IF
REVISED BY: IP
CHECKED BY: IP

TITLE:
CITY OF EDINBURG
NORTH PARK SPORT COMPLEX
MECHANICAL CONCESSION PLAN

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE: FULL: AS SHOWN
HALF: N.T.S.

TBPE REG. NO. F-13016

DATE: 08/14/19

SHEET NO.:
M1.1 OF XX

55.34'

T:\2019\19.2.30\DWGs\19.2.30 MECH.dwg - Aug 14, 2019 - 11:42AM

GENERAL NOTES - MECHANICAL:

(1) THE MECHANICAL CONTRACTOR IS FULLY RESPONSIBLE FOR PERFORMING THE WORK IN FULL COMPLIANCE WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL CODES UNDER THIS SECTION OF THE CONTRACT. IF THE CONTRACTOR DETERMINES THAT THE CONTRACT DOCUMENTS AND PLANS ARE NOT IN COMPLIANCE WITH THE APPLICABLE LOCAL CODES, HE/SHE SHALL INFORM THE ARCHITECT PRIOR TO CONSTRUCTION START FOR DIRECTION. FAILURE TO DO SO SHALL NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY TO MEET APPLICABLE LOCAL CODES, AND RE-WORK SHALL BE AT CONTRACTOR'S EXPENSE.

(2) CONTRACTOR SHALL HANG AND INSTALL ALL DUCTWORK FLUSH WITH THE BUILDING STRUCTURE TO ACCOMMODATE NEW CEILINGS. CONTRACTOR SHALL COORDINATE ALL INSTALLATION WORK WITH ARCHITECTURAL AND ELECTRICAL DESIGN. ALL DUCTWORK SHALL BE MODIFIED AS NECESSARY AND REQUIRED TO FIT AROUND BUILDING STRUCTURES, ARCHITECTURAL BUILD-OUT AND ELECTRICAL CABLE TRAY INSTALLATIONS. MECHANICAL CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE WORK SCOPE OF OTHER TRADES AND PARTICIPATE IN COORDINATING ALL CONSTRUCTION EFFORTS.

(3) CONNECT EACH DIFFUSER TO THE MAIN DISTRIBUTION DUCTS WITH A FLEX-DUCT SECTION; CONNECTIONS SHALL BE COMPLETED IN ACCORDANCE WITH THE DETAIL. EACH FLEX-DUCT CONNECTION SHALL INCLUDE A BUTTERFLY DAMPER TO BE INSTALLED AT THE TRUNK DUCT.

(4) CONTRACTOR SHALL PROVIDE ALL DUCTWORK REQUIRED TO COMPLETE THE HVAC SYSTEM. TIE IN BRANCH DUCTS TO MAIN DUCTS WITH SHEET METAL FLANGES. FLANGE CONNECTION SHALL BE FASTENED WITH CRIMPED SHEET METAL STRIPS AND SEALED WITH SILICONE CAULK.

(5) CONTRACTOR SHALL SUPPLY AND INSTALL FIRE DAMPERS AND ACCESS DOORS IN THE HORIZONTAL DUCTS WHERE THEY PENETRATE FIRE WALLS & BARRIERS.

(6) ALL OPENINGS CUT IN MASONRY AND PLASTER WALLS OR CONCRETE FLOORS SHALL BE CORE DRILLED OR SAWED WHEN POSSIBLE. CONTRACTOR SHALL CHECK BUILDING CONSTRUCTION BEFORE MAKING PENETRATIONS TO AVOID CUTTING THROUGH STRUCTURAL BEAMS AND REINFORCING. CONTRACTOR SHALL INFORM THE ENGINEER IF REINFORCING IS CUT OR DAMAGED WHILE MAKING OPENINGS. CONTRACTOR SHALL REINFORCE ALL OPENINGS AS REQUIRED BY DRAWINGS AND SPECIFICATIONS. PATCH AND SEAL OPENINGS WITH 8000 PSI CEMENT GROUT. INSTALL DECORATIVE TRIM (EQUIPMENT FLANGES, FRAMING OR ESCUTCHEONS) AROUND OPENINGS IN FINISHED AREAS. COORDINATE ALL CUTTING AND PATCHING WITH THE OTHER TRADES

(7) ON ANY WORK SHOWN ON MECHANICAL DRAWINGS REQUIRING DEMOLITION OF EXISTING OR NEW BUILDING STRUCTURES AND FINISHES, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO COMPLETE THE NECESSARY DEMOLITION. CONTRACTOR SHALL PATCH AND REPAIR ALL DEMOLITION WORK. PATCHING SHALL BE COMPLETED WITH THE SAME MATERIALS AS THE SURROUNDING AREAS, OR WITH ARCHITECT-APPROVED PATCHING MATERIALS. REPAIRS SHALL BE COMPLETED ACCORDING TO ARCHITECTURAL SPECIFICATIONS. ALL REFINISHING SHALL BE APPROVED BY THE ARCHITECT.

(8) CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLETING THE INSTALLATION OF THE AIR DISTRIBUTION SYSTEM SHOWN. DUCTWORK, DUCT ACCESSORIES AND CONTROLS SHOWN AND REQUIRED SHALL BE SUPPLIED AND INSTALLED. ALL INSTALLATION WORK SHALL BE DONE IN ACCORDANCE WITH APPLICABLE CODES, INCLUDING NFFA 90A AND 90B.(NFPA 90A: STANDARD FOR THE INSTALLATION OF AIR-CONDITIONING AND VENTILATING SYSTEMS)(NFPA 90B: STANDARD FOR THE INSTALLATION OF WARM AIR HEATING AND AIR-CONDITIONING SYSTEMS)

(9) CONTRACTOR SHALL BALANCE ALL AIR DISTRIBUTION SYSTEMS TO ACHIEVE THE AIR VOLUME REQUIREMENTS INDICATED. BALANCING SHALL INCLUDE ADJUSTMENT OF ALL MANUAL VOLUME DAMPERS, SHUTTER DAMPERS, ZONE DAMPERS (IF REQUIRED), BUTTERFLY DAMPERS AND INDIVIDUAL DIFFUSER VOLUME DAMPERS (FINAL BALANCING ONLY). CONTRACTOR SHALL SUPPLY THE ENGINEER WITH A COMPLETE BALANCING REPORT WHICH INCLUDES, VOLUME, ROOM REFERENCE AND ZONE VOLUME TOTALS.

(10) MOUNT ALL THERMOSTATS (SENSORS) 48" ABOVE THE FINISHED FLOOR LEVEL. THERMOSTATS SHOWN SHALL BE IN CONTROL OF THE ZONE SYSTEM WHICH IS SUPPLYING AIR TO THE AREA WHERE THE THERMOSTAT IS LOCATED. CONTRACTOR SHALL SUPPLY AND INSTALL ALL CONTROL VOLTAGE WIRING AND CONDUIT FOR THERMOSTAT (DDC CONTROL) INSTALLATION.

(11) CONTRACTOR SHALL INSTALL NEW REFRIGERANT PIPING FLUSH WITH THE BUILDING STRUCTURE AND MECHANICAL ROOM BOUNDARIES AS SHOWN. CONTRACTOR SHALL COORDINATE ALL INSTALLATION WORK WITH DUCTS AND ELECTRICAL CONDUIT. MECHANICAL CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE WORK SCOPE OF OTHER TRADES AND PARTICIPATE IN COORDINATING ALL CONSTRUCTION EFFORTS.

(12) ALL PIPING SHALL BE INSULATED AND JACKETED. REFER TO THE SPECIFICATIONS. THE CONDENSING AND ROOF TOP CONDENSER COILS ARE TO BE COATED IN ACCORDANCE WITH THE SPECIFICATIONS.

(13) PROVIDE SMOKE DETECTOR AND SHUTDOWN CONTROLS ON AIR HANDLERS AND SUPPLY FANS. SMOKE DETECTORS SHALL BE PROVIDED BY ELECTRICAL AND INSTALLED BY MECHANICAL. COORDINATE TO PROVIDE A COMPLETE SYSTEM. PROVIDE BOTH SUPPLY AND RETURN SIDE DEVICES.

(14) PROVIDE SEVEN DAY PROGRAMMABLE THERMOSTAT, 24 HOUR SINGLE/MULTI STAGE COMMERCIAL THERMOSTAT, DUAL SET POINTS, OCCUPIED AND UNOCCUPIED PERIODS, UNIT OPTIMIZATION, AUTO HEATING/COOLING AND AUTO CHANGE OVER, SUB-BASE BACK-UP BATTERY AND TEMPORARY OVER-RIDE. 24 VAC CONTROL VOLTAGE. PROVIDE PLASTIC SEE THRU PROTECTIVE COVER WITH KEY LOCK.

(15) **FILTER INSTALLATION AND REPLACEMENT**

A. INSTALL CONSTRUCTION RETURN FILTER AT EACH RETURN GRILLE BEFORE OPERATING PERMANENT AIR HANDLERS DURING CONSTRUCTION.

B.REPLACE FILTERS AFTER COMPLETING CONSTRUCTION AND BEFORE CONDUCTING BUILDING FLUSH-OUT.

1.REPLACE CONSTRUCTION RETURN FILTERS WITH FLUSH-OUT RETURN FILTERS.

2.REPLACE SUPPLY FILTERS.

MECHANICAL SYMBOL LEGEND

CFM
TAG — A 325(2) — QUANTITY
NECK SIZE — 10"Ø(D) — OPPOSED BLACE DAMPER

CONICAL DUCT SPIN TAP — FLEXIBLE DUCT
ROUND SHEET-METAL DUCT
BALANCING DAMPER

DETAIL NUMBER
B2
MH107
SHEET NUMBER

PERFORATED INNER METAL LINER, WHERE INDICATED (DOUBLE WALL)
HIDDEN DUCT (FOR CLARITY)

SUPPLY AIR GRILLE
SUPPLY AIR GRILLE-SLOT DIFFUSER

RETURN AIR GRILLE
ALL RETURN AIR DUCT DROPS TO INCLUDE A MANUAL DAMPER

T — THERMOSTAT
S — TEMPERATURE SENSOR
O — TEMPERATURE OVERRIDE SENSOR/SWITCH

FD — FIRE DAMPER W/ ACCESSIBLE DUCT ACCESS DOOR
FSD — FIRE/SMOKE DAMPER W/ ACCESSIBLE DUCT ACCESS DOOR

FLOW DIRECTION

PIPE DROP

PIPE RISE

RETURN AIR DUCT RISE/DROP

SUPPLY AIR DUCT RISE/DROP

WALL OR FLOOR SLEEVE

CHILLED WATER SUPPLY/RETURN PIPING

SQUARE — ROUND — SQUARE TO ROUND DUCT TRANSITION

MECHANICAL ABBREVIATIONS

A/C	AIR CONDITIONED	MAX	MAXIMUM
AD	ACCESS DOOR	MBD	MANUAL BALANCING DAMPER
AFF	ABOVE FINISHED FLOOR	MD	MOTORIZED DAMPER
AHU	AIR HANDLING UNIT	MECH	MECHANICAL
APPROX	APPROXIMATE	MIN	MINIMUM
ARCH	ARCHITECTURAL	MS	MOTOR STARTER
BDD	BACK DRAFT DAMPER	NA	NOT APPLICABLE
BHP	BRAKE HORSEPOWER	NC	NORMALLY CLOSED
BTU	BRITISH THERMAL UNIT	NIC	NOT IN CONTRACT
CFM	CUBIC FEET PER MINUTE	NO	NORMALLY OPEN
CH	CHILLER	NTS	NOT TO SCALE
CHP	CHILLED WATER PUMP		
CLG	CEILING	OA	OUTSIDE AIR
CWP	CONDENSER WATER PUMP	OAH	OUTSIDE AIR INTAKE HOOD
CO	CLEANOUT	OBD	OPPOSED BLADE DAMPER
CT	COOLING TOWER	OC	ON CENTER
CU	CONDENSING UNIT		
CW	COLD WATER	P	PUMP
CL	CENTER LINE	PBD	PARALLEL BLADE DAMPER
		PP	PRIMARY CHILLED WATER PUMP
DB	DRY BULB	PRESS	PRESSURE
DIA	DIAMETER	PRV	PRESSURE REDUCING VALVE
DN	DOWN	PSIG	POUNDS PER SQUARE INCH (GAUGE)
DWG	DRAWING		
DX	DIRECT EXPANSION	R	RETURN (AIR DEVICE)
EAT	ENTERING AIR TEMPERATURE	RA	RETURN AIR
EDH	ELECTRIC DUCT HEATER	RE:	REFER TO DETAIL 4, SHEET M7.01
EF	EXHAUST FAN	RET	RETURN
ELEC	ELECTRICAL	RH	RELATIVE HUMIDITY
ELEV	ELEVATION	RHD	RELIEF HOOD
F	DEGREES FAHRENHEIT	RPM	REVOLUTIONS PER MINUTE
FC	FAN COIL	RTU	ROOF TOP UNIT
FD	FIRE DAMPER W/ DUCT ACCESS DOOR		
FLEX	FLEXIBLE	S	SUPPLY (AIR DEVICE)
FLG	FLANGE	SA	SUPPLY AIR
FLR	FLOOR	SCH	SCHEDULE
FPM	FEET PER MINUTE	SCHP	SECONDARY CHILLED WATER PUMP
FT	FEET, FOOT	SD	SMOKE DAMPER
FS	FLOW SWITCH	SEC	SECOND
		SF	SUPPLY FAN
GAL	GALLON	SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
GALV	GALVANIZED		
GPM	GALLONS PER MINUTE	SP	STATIC PRESSURE
HB	HOSE BIBB	SPEC	SPECIFICATION
HP	HORSEPOWER	SF	SQUARE FOOT
HR	HEAT PUMP (WATER SOURCE)	STD	STANDARD
HR	HOUR	TEMP	TEMPERATURE
HVAC	HEATING/VENTILATING/ AIR CONDITIONING	T'STAT	THERMOSTAT
		TYP	TYPICAL
HWP	HOT WATER PUMP	UF	UNDER FLOOR
HZ	HERTZ	UH	UNIT HEATER
ID	INSIDE DIAMETER	UL	UNDERWRITERS LABORATORIES
IE	INVERT ELEVATION (FLOW LINE)		
IN	INCHES	VEL	VELOCITY
INSUL	INSULATION	VENT	VENTILATE
IN WG	INCHES OF WATER	VF	VENTILATION FAN
KW	KILOWATT(S)	VOL	VOLUME
		VOLT	VOLTAGE
LAT	LEAVING AIR TEMPERATURE	W	WIDE, WIDTH
LB	POUND	W/	WITH
L	LOUVER	WB	WET BULB
		W/O	WITHOUT

FAN SCHEDULE

TAG	EF-1	EF-2
SERVICE	RESTROOMS	CONCESSION
LOCATION	ROOF	ROOF
FAN PROPERTIES		
CFM	1,200	500
FAN RPM	1271	1593
EXT SP (IN WG)	0.5	0.5
FAN POWER	1/2 - ECM	1/6 HP
VOLTS/PHASE	120/1	120/1
SOUND LEVEL	9.9 SONES	7.7 SONES
MOUNTING	14" TDI CURB	14" TDI CURB
MANUFACTURER	GREENHECK	GREENHECK
MODEL	G-123-VG	G-090-VG
MAX WEIGHT	75 lbs	50 lbs
NOTES	1-8	1,3-9

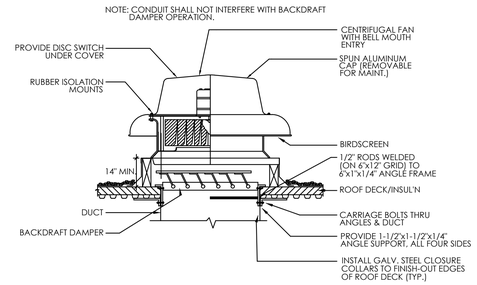
NOTES:
01. PROVIDE WITH FACTORY INSTALLED DISCONNECT.
02. INTERLOCK FAN W/ LIGHTS.
03. PROVIDE W/ BACKDRAFT DAMPER.
04. PROVIDE W/ FAN SPEED CONTROL.
05. PROVIDE W/ TIMED DELAY SHUTOFF
06. PROVIDE IBC 2015 COMPLIANT CURB & ATTACHMENTS FROM UNIT TO CURB & CURB TO STRUCTURE. EQUIPMENT OR CURB MANUFACTURER IS RESPONSIBLE FOR PROVIDING ENGINEERED DETAIL ANALYSIS OF:
A) ATTACHMENT OF EQUIPMENT TO CURB.
B) CURB TO STRUCTURE.
C) CURB & ATTACHMENT HARDWARE STRENGTH.
REFER TO ARCHITECTURAL & STRUCTURAL DRAWINGS FOR ROOF SUBSTRATE DETAILS. EQUIPMENT OR CURB MANUFACTURER IS ALSO RESPONSIBLE FOR PROVIDING ENGINEERED INSTALLATION DRAWINGS FOR ITEMS 'A' & 'B' LISTED ABOVE. BOTH, THE ENGINEERED ANALYSIS & THE ENGINEERED INSTALLATION DRAWINGS SHALL BE PERFORMED SPECIFICALLY FOR THIS BUILDING & PROJECT SITE & STAMPED & SEALED BY A TEXAS LICENSED ENGINEER. SUBMITTALS WILL NOT BE APPROVED UNTIL ALL DOCUMENTATION LISTED ABOVE IS PROVIDED ACCURATELY.
07. PROVIDE W/ FAN MOUNTED POTENTIOMETER FOR SPEED CONTROL.
08. PROVIDE W/ LIFTING LUGS.
09. PROVIDE W/ WALL MOUNTED SWITCH, LABELED "VENT FAN".

AIR DEVICE SCHEDULE

TAG	A	B
SERVICE TYPE	EXHAUST	EXHAUST
PHYSICAL PROPERTIES		
FACE SIZE	14"x14"	10"x10"
NECK SIZE	12"x12"	8"x8"
MOUNTING SURFACE	CEILING	CEILING
DETAILS AND ACCESSORIES		
DAMPER TYPE	OPPOSED BLADE	OPPOSED BLADE
ACCESSORY	NONE	NONE
COLOR FINISH	WHITE	WHITE
MATERIAL	14 GA STEEL	14 GA STEEL
MANUFACTURER	PRICE	PRICE
MODEL	MSL	MSL
NOTES	1	1

NOTES:
01. USE TAMPER RESISTANT FASTENERS.

01



ROOF MTD. EXHAUST FAN
NO SCALE

H.V.A.C. SYSTEM — SECTION 15500

THE WORK INCLUDES PROVIDING THE HVAC SYSTEMS, INCLUDING DUCTWORK, DIFFUSERS AND GRILLES, INSULATION, CONTROLS, AND ALL OTHER EQUIPMENT NECESSARY FOR A COMPLETE FUNCTIONING SYSTEM. HVAC SYSTEM SHALL INCLUDE BUT IS NOT LIMITED TO THE FOLLOWING:

- HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) UNITS.
- SUPPLY AND RETURN DUCTWORK SYSTEMS WITH GRILLES, DIFFUSERS, FILTERS, AND DAMPERS.
- TEMPERATURE CONTROL SYSTEM INCLUDING LOW VOLTAGE WIRING AND CONDUIT.
- DUCT, PIPING, AND EQUIPMENT INSULATION, WHERE INDICATED HEREIN.
- CONTROLS AND WIRING FOR CONNECTION TO LANDLORD'S FIRE-SMOKE ALARM SYSTEM (WHERE APPLICABLE).

THE CONTRACTOR SHALL COORDINATE ALL NEW DUCTWORK INCLUDING DUCTWORK INSULATION AND REINFORCING WITH EXISTING DUCTWORK AND DUCTWORK ANGLE BRACING SUCH THAT THE NEW DUCTWORK WILL FIT WITHIN THE SPACE LIMITATIONS OF THE PROJECT.

CONDENSATE PIPING: CONDENSATE PIPING SHALL BE A MINIMUM OF 3/4" COPPER TYPE "L" PIPE. ALL CONDENSATE DRAINS SHALL BE INSULATED WITH 1/2" THICK CLOSED CELL INSULATION SIMILAR TO ARMAFLEX 2000.

THE DESIGN, SELECTION, SPACING AND APPLICATION OF HORIZONTAL PIPE HANGERS, SUPPORTS, RESTRAINTS, ANCHORS AND GUIDES SHALL BE IN ACCORDANCE WITH THE STANDARD CODE FOR PRESSURE PIPING ANSI B31.1 AND THE LATEST EDITION OF THE MANUFACTURERS' STANDARDIZATION SOCIETY STANDARDS MSS SP- 69, "PIPE HANGERS AND SUPPORTS--SELECTION AND APPLICATION".

PROVIDE PIPE COVERING PROTECTION SHIELDS AND SADDLES FOR ALL INSULATED PIPING AT THE LOCATIONS OF ALL SUPPORTS. THE PROTECTION SHIELD LENGTH AND GAUGE THICKNESS FOR USE AT EACH CLEVIS HANGER SHALL BE AS SPECIFIED FOR TYPE 40 PROTECTION SHIELDS IN THE CURRENT EDITION OF MSS SP-69. PROTECTION SHIELDS SHALL BE GALVANIZED AND SHALL BE ARRANGED TO COVER ONE-HALF OF THE CIRCUMFERENCE OF THE INSULATION AND SHALL BE MOUNTED ON THE OUTSIDE OF THE INSULATION WITH INSULATION BLOCKING BETWEEN THE PIPE AND SADDLE TO PREVENT CRUSHING OF THE INSULATION. INSULATION BLOCKING SHALL BE UP.JOHN 2 POUND HIGH DENSITY MOLDED URETHANE OR SEGMENTED MACHINERY CORK DIPPED IN HOT ASPHALT VAPOR SEAL OF NOT LESS THAN THE SAME LENGTH AND CIRCUMFERENCE AS THE PIPE PROTECTION SHIELD.

ALL HANGERS, HARDWARE, RODS, CLAMPS, CHANNELS, BASE PLATES, ANGLES, BOLTS, NUTS AND OTHER FACTORY-BUILT OR SHOP FABRICATED PIPE SUPPORT DEVICES SHALL BE GALVANIZED OR CADMIUM PLATED UNLESS NOTED OTHERWISE ON THE DRAWINGS. ALL SHOP FABRICATED AND WELDED STEEL SUPPORTS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION.

ALL CONCRETE INSERTS FOR HANGER RODS SHALL BE NATIONAL PIPE HANGERS CORPORATION FIGURE 606 WITH FIGURE 607, OR GRINNELL FIGURE 282, FIGURE 152, OR APPROVED EQUAL. METAL DECK CONCRETE INSERT SHALL BE F & S MANUFACTURING CORPORATION FIGURE 282, GALVANIZED FABRICATED STEEL METAL DECK CEILING BOLT, PHILLIPS RED HEAD, OR APPROVED EQUAL. HANGER RODS, INSERTS, ETC., SHALL BE SIZED AND INSTALLED AS RECOMMENDED BY THE HANGER MANUFACTURER FOR THE SERVICE INTENDED.

FIELD VERIFY THE EXACT SIZES AND LOCATIONS OF ALL EXISTING DUCTWORK AND PIPING PRIOR TO DEMOLITION OF ANY EXISTING WORK. THE DEMOLITION WORK SHALL BE COORDINATED WITH THE NEW WORK TO ASSURE PROPER LIMITS OF DEMOLITION.

WARRANTY: PROVIDE LABOR AND MATERIALS TO REPAIR OR REPLACE DEFECTIVE PARTS AND MATERIALS AS REQUIRED FOR ONE YEAR AFTER SUBSTANTIAL COMPLETION OR OWNER ACCEPTANCE OF THE COMPLETED PROJECT. PROVIDE A SEPARATE LINE ITEM DEDUCT AMOUNT ON THE PROPOSAL FORM TO DELETE WARRANTY SERVICE, AT THE OWNER'S OPTION.

DRAWINGS FOR HVAC WORK ARE DIAGRAMMATIC, SHOWING THE GENERAL LOCATION, TYPE, LAYOUT, AND EQUIPMENT REQUIRED. THE DRAWINGS SHALL NOT BE SCALED FOR EXACT MEASUREMENTS. REFER TO MANUFACTURER'S STANDARD INSTALLATION DRAWINGS FOR EQUIPMENT CONNECTIONS AND INSTALLATION REQUIREMENTS, AS REQUIRED. PROVIDE ALL DUCTWORK, CONNECTIONS, ACCESSORIES, OFFSETS, AND MATERIALS NECESSARY TO FACILITATE THE SYSTEM FUNCTIONING AS INDICATED BY THE DESIGN AND THE EQUIPMENT INDICATED. THE WORK SHALL BE IN ACCORDANCE WITH LOCAL CODES OR ORDINANCES AND SUBJECT TO INSPECTION.

COORDINATE WITH THE WORK OF OTHER SECTIONS, EQUIPMENT FURNISHED BY OTHERS, REQUIREMENTS OF THE LANDLORD, AND WITH THE CONSTRAINTS OF THE EXISTING CONDITIONS OF THE PROJECT SITE.

EXTRA STOCK: PROVIDE TWO SETS OF REPLACEMENT FILTERS PER EACH INSTALLED FOR ALL THE ROOFTOP UNITS, AND OTHER EQUIPMENT AND DEVICES, AND PROVIDE AN ITEMIZED LIST OF THE NUMBER, TYPE REQUIRED, AND WHERE USED. OBTAIN RECEIPT FROM OWNER THAT THESE ITEMS HAVE BEEN DELIVERED AND ACCEPTED BY THE OWNER'S REPRESENTATIVE.

DUCT DIMENSIONS: UNLESS OTHERWISE NOTED, DUCT DIMENSIONS ON DRAWING ARE SHEET METAL DIMENSIONS ON UNLINED DUCTS (INTERIOR DIMENSIONS).

SHEET METAL DUCTWORK: SHEET METAL DUCTWORK SHALL BE FABRICATED AND INSTALLED TO MEET ASHRAE AND SMACNA STANDARDS, FOR 1" W.G. PRESSURE CLASS. SHEET METAL SHALL BE GALVANIZED SHEET STEEL OF LOCK FORMING QUALITY, ASTM A-525. ALL ANGLE IRON USED FOR SUPPORT SHALL BE GALVANIZED. CONNECTIONS TO WALLS OR FLOOR SHALL BE AIR TIGHT WITH ANGLE IRON AND CAULKING. SEAL ALL DUCT SEAMS, TRANSVERSE AND LONGITUDINAL, AIR TIGHT. PROVIDE TURNING VANES AT ALL ELBOWS OR OFFSETS EXCEEDING 30°.

DUCT SHALL BE EXTERNALLY WRAPPED W/ 2" FIBERGLASS BLANKET INSULATION.

RIGID ROUND GALVANIZED DUCT SHALL BE SPIRAL OR SNAP LOCK GALVANIZED SHEETMETAL COMPLYING WITH SMACNA.

FIBERGLASS DUCT BOARD IS AN ACCEPTABLE W/ PRIOR WRITTEN OWNER PERMISSION. MINIMUM R-VALUE OF 5 REQUIRED FOR CONDITIONED SPACES AND MINIMUM R-VALUE OF 8 FOR UNCONDITIONED SPACES.

FLEXIBLE DUCT CONNECTOR: WHERE INDICATED PROVIDE U.L. LABELED 30oz. NEOPRENE COATED FIBERGLASS FABRIC DUCT CONNECTORS.

GRILLES AND DIFFUSERS: PROVIDE GRILLES, DIFFUSERS, AND DAMPERS IN SIZES, CAPACITIES, MATERIALS, AND PATTERN INDICATED ON THE DRAWINGS.

ACCESS PANELS: PROVIDE HINGED ACCESS PANELS IN DUCTWORK WHERE REQUIRED FOR ACCESS TO EQUIPMENT. PROVIDE INSULATED ACCESS DOORS IN INSULATED DUCTWORK.

PROVIDE WHERE APPLICABLE, DUCT MOUNTED SUPPLY AND/OR RETURN AIR PHOTOELECTRIC TYPE UL LISTED SMOKE DETECTORS. DETECTORS SHALL BE LISTED FOR THE AIR VELOCITIES ENCOUNTERED. PROVIDE INTERLOCK WIRING AND RELAYS FOR UNIT SHUT DOWN. ON ACTIVATION OF ANY DETECTOR, ALL HVAC UNIT FANS SHALL STOP.

TEST AND ADJUST EACH PIECE OF EQUIPMENT AND EACH SYSTEM AS REQUIRED TO ASSURE PROPER BALANCE AND OPERATION. TEST AND BALANCE SHALL BE PERFORMED BY AN INDEPENDENT NEBB OR AABC REGISTERED CONTRACTOR. ELIMINATE NOISE AND VIBRATION, AND ASSURE PROPER FUNCTION OF ALL CONTROLS, MAINTENANCE OF TEMPERATURE, AND OPERATION. BALANCE MECHANICAL SYSTEM, AND SUBMIT COMPLETED TEST

EXPOSED ROUND (SPIRAL) DUCT TO BE INTERNALLY LINED. SUPPLY DUCTWORK SHALL BE LINED W/1" INSULATION. RETURN/EXHUAST/VENTILATION DUCT TO BE LINED W/1/2" INSULATION. CONCEALED ROUND DUCT TO BE EXTERNALLY INSULATED. USING R-5 INSULATION MIN FOR CONDITIONED SPACES (WHERE PLENUM RETURN IS USED) OR R-8 INSULATION MIN FOR UNCONDITIONED SPACES.

08/14/19

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Texas Registered Engineering Firm - F10362
Project number: T:\2019\19.2.30\DWGs\19.2.30 MECH.dwg

STATE OF TEXAS — Wilford L. McGee III — 121939 — REGISTERED — PROFESSIONAL ENGINEER

FILE NAME:
DATE: 7/3/19
SURVEYED BY:
DESIGNED BY: IF
DRAWN BY: IF
REVISED BY: IP
CHECKED BY: IP

TITLE: CITY OF EDINBURG — NORTH PARK SPORT COMPLEX — MECHANICAL LEGEND & SCHEDULES

SDI ENGINEERING, LLC
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TBPE REG. NO. F-13016

SCALE: FULL: AS SHOWN; HALF: N.T.S.

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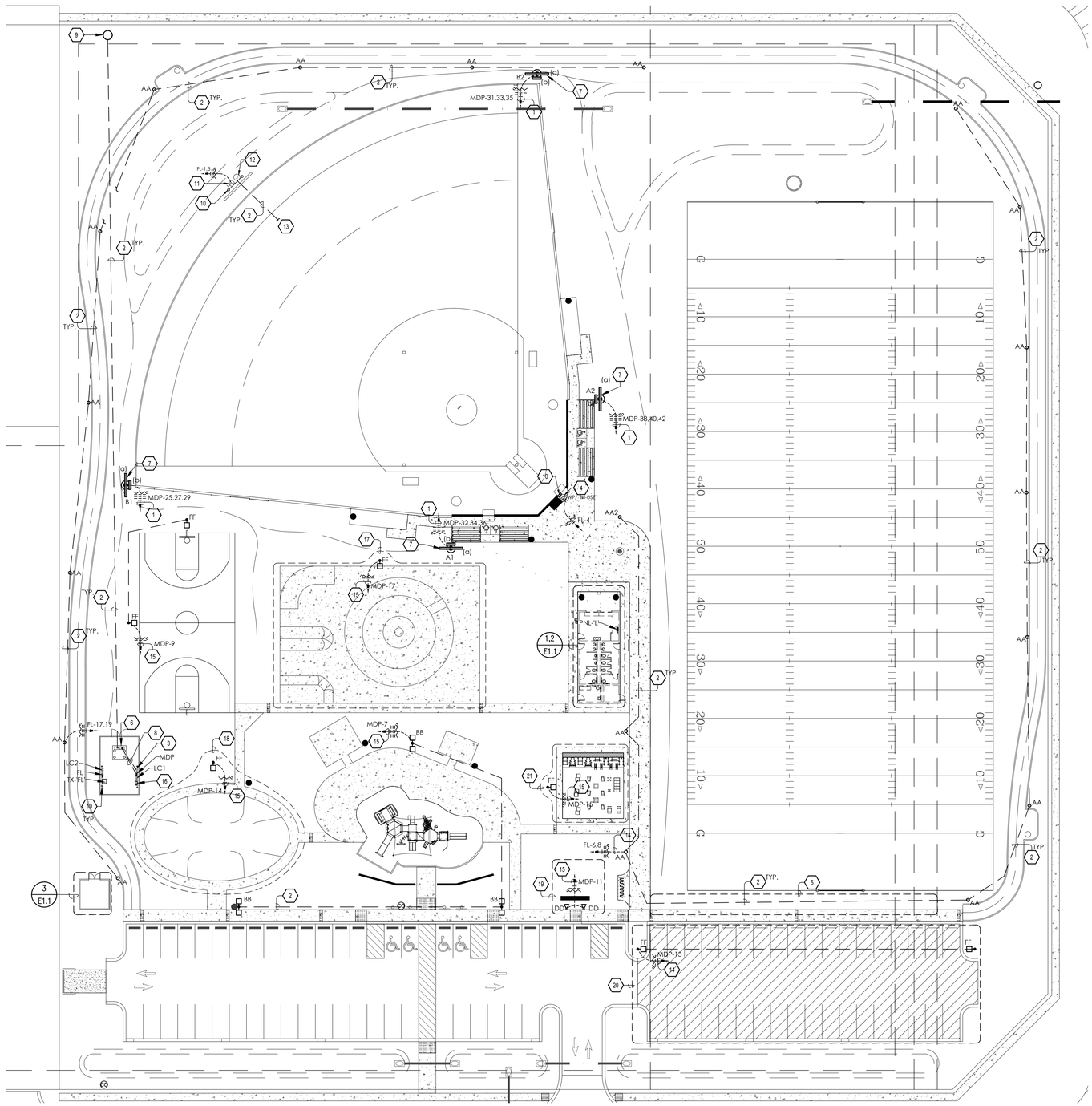

1 ELECTRICAL SITE PLAN
SCALE: 1"=30'-0"

GENERAL ELECTRICAL NOTES (TO ALL SHEETS)

A. CONTRACTOR TO VERIFY ALL EXISTING MAIN POWER SERVICES AND COORDINATE WITH POWER COMPANY FOR ALL NEW REQUIREMENTS AND ALL COST ASSOCIATED. CONTRACTOR SHALL INCLUDE ANY COST FOR THE NEW TRANSFORMER AND OTHER ASSOCIATED FEES IN BID. CONTRACTOR IS RESPONSIBLE TO VERIFY ALL FEES WITH POWER COMPANY AND TO INCLUDE IN BID. CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH POWER COMPANY AS SOON THE CONTRACT IS AWARDED TO ORDER TRANSFORMER AND THE RELATED ELECTRICAL SERVICE EQUIPMENT AS SOON AS POSSIBLE.

B. CONTRACTOR IS RESPONSIBLE FOR ALL EXCAVATION, TRENCHING AND BACKFILLING. COORDINATE WITH ALL UTILITIES PRIOR TO EXCAVATION.

C. CONTRACTOR IS RESPONSIBLE TO IDENTIFY ALL EXISTING UNDERGROUND UTILITIES PRIOR TO ANY WORK. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGES TO EXISTING UNDERGROUND UTILITIES. CONTRACTOR SHALL REPAIR DAMAGES AT NO COST TO CONTRACT.

D. ALL ELECTRICAL EQUIPMENT OUTDOORS SHALL BE RATED TYPE NEMA 3R UNLESS OTHERWISE NOTED.

E. CONTRACTOR SHALL HAVE A WORKING KNOWLEDGE OF LOCAL CODES AND ORDINANCES. ALL WORK SHALL CONFORM TO NATIONAL ELECTRICAL CODES AND ALL OTHER AUTHORITY HAVING JURISDICTION. OBTAIN PERMITS AND PAY ALL FEES. PERFORM MODIFICATIONS TO MEET CODE AND ORDINANCE REQUIREMENTS AT NO ADDITIONAL COST TO OWNER. ARCHITECT OR ENGINEER. VERIFY PRIOR TO BID DATE.

F. VERIFY AT JOB SITE THE EXACT LOCATIONS OF STRUCTURAL MEMBERS SUCH AS BEAMS, COLUMNS, ETC. TO LOCATE EQUIPMENT CONDUIT, PANELS AND DEVICES. IF DEVIATIONS FROM THE DRAWING ARE NECESSARY TO MEET STRUCTURAL CONDITIONS MAKE DEVIATIONS WITHOUT ADDITIONAL COST. TO OWNER, ARCHITECT, OR ENGINEER.

G. IN COOPERATION WITH OTHER CONTRACTORS, DETERMINE THE EXACT LOCATION OF EQUIPMENT AND DEVICES AND CONNECTIONS THERETO BY REFERENCE TO THE SUBMITTALS AND ROUGH-IN DRAWINGS, AND BY MEASUREMENTS AT THE SITE. REFER TO ALL OTHER TRADES SUBMITTAL FOR ELECTRICAL INFORMATION.

H. GROUND ENTIRE ELECTRICAL SYSTEM IN STRICT ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE.

I. VERIFY AT JOB SITE GENERAL WORK TO BE DONE AS SPECIFIED, AS NOTED, OR AS REQUIRED FOR INSTALLATION ELECTRICAL SYSTEMS PRIOR TO SUBMISSION OF BIDS.

J. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS AND EQUIPMENT TO BE REMOVED AND REPLACED BEFORE SUBMITTING HIS BID.

K. ELECTRICAL DRAWINGS ARE DIAGRAMMATIC AND SMALL SCALE ONLY. THEY CONVEY THE INTENT OF THE WORK BUT DO NOT SHOW DETAIL SUCH AS JUNCTION AND PULL BOXES REQUIRED BY THE SPECIFICATIONS AND THE NATIONAL ELECTRICAL CODE(NEC). PROVIDE ALL MATERIALS AND METHODS CALLED FOR IN THE SPECIFICATIONS AND AS REQUIRED IN THE NEC TO PROVIDE A COMPLETE INSTALLATION OF ALL WORK.

L. ALL WIRING SHALL BE COPPER.

M. ALL SLEEVES, PENETRATIONS, ETC. SHALL BE SEALED SOLID NON-SHRINKING MATERIAL IMMEDIATELY UPON FILLING OF THE OPENING WITH PIPE OR CONDUIT.

N. ARRANGE FOR SOURCES OF TEMPORARY CONSTRUCTION SERVICES. SUCH SERVICES SHALL BE NOMINALLY 120/240V, 1-PHASE, 3-WIRE FROM WHICH A COMPLETE SYSTEM OF TEMPORARY POWER AND LIGHTING SHALL BE PROVIDED FOR ALL CONSTRUCTION NEEDS.

KEYED NOTES: ELECTRICAL

1. SHALL BE CONTROLLED VIA SPORTS LIGHTING CONTROL CABINET.
2. PROPOSED CONDUIT PATH. CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH EXISTING UNDERGROUND UTILITIES PRIOR TO ANY WORK. PROVIDE ALL TRENCHING AND BACK FILLING FOR NEW CONDUITS. REFER TO PANEL ELECTRICAL PANEL SCHEDULES FOR CIRCUIT SIZE.
3. NEW ELECTRICAL SERVICE METER, 480/277V, 3Ø, 4W.
4. MOUNT WIRING DEVICE SAME HEIGHT AS SCORE KEEPER PLATFORM. REFER TO ARCHITECTURAL DRAWINGS.
5. CONDUIT PASSING THROUGH EASEMENT SHALL BE A MINIMUM DEPTH OF 48". CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH EXISTING UNDERGROUND UTILITIES PRIOR TO ANY WORK.
6. NEW 480/277, 3Ø, 4W, UTILITY PAD MOUNT TRANSFORMER. PROVIDE CONCRETE PAD.
7. POLE SHALL HAVE 2 FIXTURES AT DIFFERENT HEIGHTS. REFER TO SPORT FIELD LIGHTING SCHEDULE.
8. CONTRACTOR TO PROVIDE AND INSTALL PVC CONDUIT FROM NEW UTILITY TRANSFORMER TO NEW ELECTRICAL SERVICE EQUIPMENT PER POWER COMPANY STANDARDS. VERIFY ALL REQUIREMENTS PRIOR TO ANY ROUGH-IN. REFER TO ELECTRICAL RISER DIAGRAM.
9. NEW POWER COMPANY POWER POLE WITH RISER DIP POLE.
10. GALVANIZED 3" PIPE AND GALVANIZED UNISTRUT STAND.
11. SCOREBOARD CIRCUIT. VERIFY EXACT LOCATION AND ALL ELECTRICAL REQUIREMENTS WITH EQUIPMENT SUPPLIER/OWNER PRIOR TO ANY ROUGH-INS.
12. PROVIDE WEATHER-PROOF NEMA-3R J-BOX FOR SCORE BOARD CONTROLS. COORDINATE EXACT LOCATION WITH EQUIPMENT SUPPLIER/OWNER PRIOR TO ROUGH-INS.
13. PROVIDE 1-2"C WITH PULLSTRING FOR SCORE BOARD CONTROLS. COORDINATE CONDUIT ROUTE WITH OWNER AND EXISTING UTILITIES. ROUTE TO SCORE KEEPER STRUCTURAL.
14. TO BE CONTROLLED VIA LIGHTING CONTACTOR 'LC2'.
15. TO BE CONTROLLED VIA LIGHTING CONTACTOR 'LC1'.
16. SPORTS LIGHTING CONTROL CABINET.
17. ALTERNATE #4
18. ALTERNATE #1
19. ALTERNATE #5
20. ALTERNATE #3
21. ALTERNATE #2

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08/14/19

STATE OF TEXAS
LEONARDO MUNOZ
97157
LICENSED PROFESSIONAL ENGINEER

FILE NAME:	
DATE:	7/3/19
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CHECKED BY:	IP

TITLE: CITY OF EDINBURG
NORTH PARK SPORT COMPLEX
ELECTRICAL SITE PLAN

55.34'

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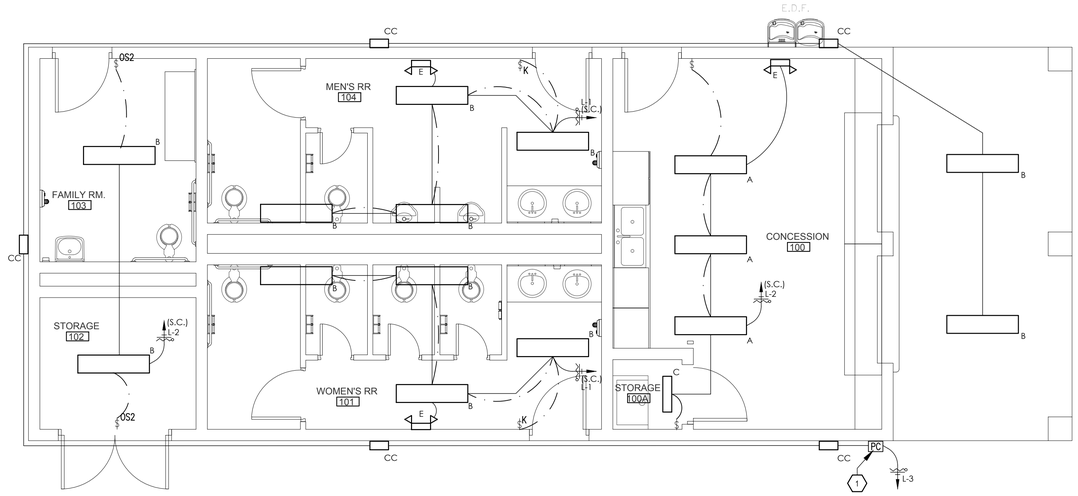
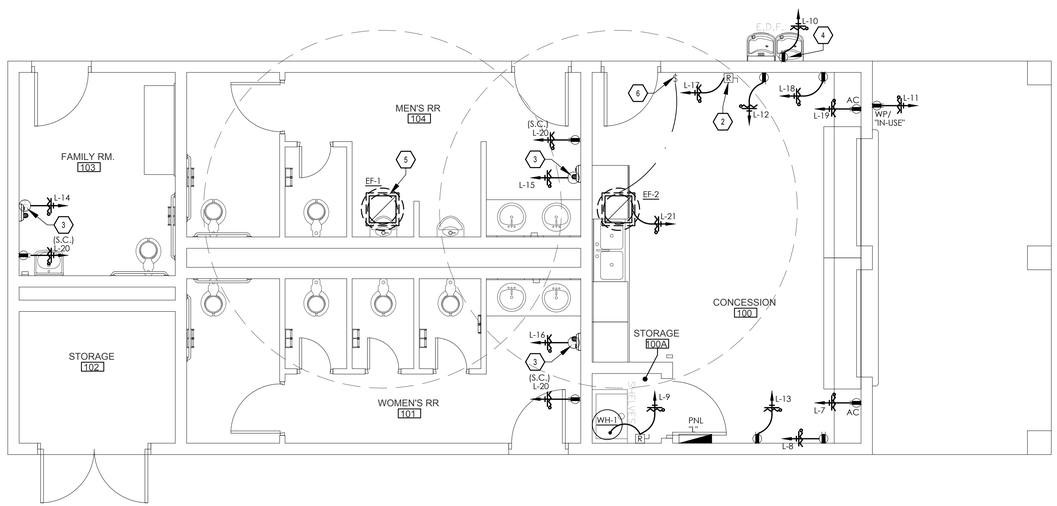
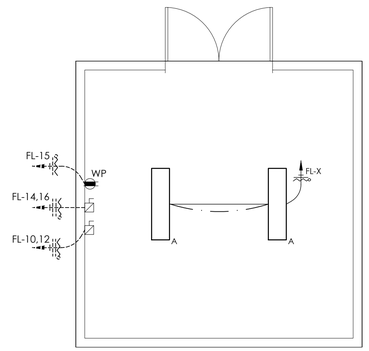


1 RESTROOM LIGHTING PLAN
SCALE: 1/4"=1'-0"



2 RESTROOM POWER PLAN
SCALE: 1/4"=1'-0"



3 PUMP ROOM
ELECTRICAL PLAN
SCALE: 1/4"=1'-0"

GENERAL NOTES: ELECTRICAL

A. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT OF ALL POWER SOURCE WIRING IN ACCORDANCE WITH ARCHITECTURAL MILLWORK.

B. ELECTRICAL CONTRACTOR SHALL MAKE FINAL CONNECTION TO H.V.A.C EQUIPMENT, PLUMBING EQUIPMENT, REFER TO PANEL SCHEDULE FOR WIRE SIZE.

C. ELECTRICAL CONTRACTOR SHALL PROVIDE STARTERS, RELAYS, CONTACTORS AND THE REQUIRED ELECTRICAL ACCESSORIES FOR MECHANICAL SYSTEM AS REQUIRED.

D. COORDINATE EXACT LOCATION OF ALL MECHANICAL EQUIPMENT IN ACCORDANCE W/MECHANICAL DRAWINGS TO MEET ELECTRICAL AND MECHANICAL REQUIRED CLEARANCE BY THE LATEST CODE.

E. NEMA RATED OUTLETS, REFER TO BREAKER SIZE AND COORDINATE WITH EQUIPMENT REQUIREMENTS PRIOR TO BID.

F. CONTRACTOR SHALL REFER TO EQUIPMENT SUBMITTAL FOR ALL ELECTRICAL REQUIREMENTS PRIOR TO COMMENCING ANY WORK.

G. ALL EXIT FIXTURES/EMERGENCY BATTERY PACK LIGHT FIXTURE SHALL BE CONNECTED TO UNSWITCHED OR NON-DIMMING HOT LEG OF SAME VOLTAGE/PHASE OF LOCAL LIGHTING CIRCUIT IN SPACE.

H. VERIFY CEILING TYPES AND COORDINATE WITH FIXTURE TYPE LIGHT FIXTURE SHALL BE COMPATIBLE WITH CEILING TYPE AS INDICATED ON THE ARCHITECTURAL DOCUMENTS. NOTIFY ENGINEER IF DISCREPANCIES EXIST PRIOR TO ORDERING FIXTURES.

I. COORDINATE EXACT ROUTING OF ALL CONDUIT ABOVE CEILING IN BUILDING. TYPICAL FOR ALL BUILDING EXTERIOR LIGHTING.

J. COORDINATE LOCATION OF LIGHTS WITH DIFFUSERS AND GRILLES.

K. SWITCH LEGS ARE NOT SHOWN WHERE SWITCHING SCHEME IS OBVIOUS.

L. CONTRACTOR SHALL REFER TO EQUIPMENT SUBMITTAL FOR ALL ELECTRICAL REQUIREMENTS PRIOR TO COMMENCING ANY WORK.

KEYED NOTES: ELECTRICAL

1. 120V PHOTOCELL. LOCATE AS DIRECTED BY MANUFACTURER.
2. DISCONNECT FOR ICE MACHINE. COORDINATE EXACT LOCATION AND ELECTRICAL REQUIREMENTS WITH EQUIPMENT SUPPLIER PRIOR TO COMMENCING ANY WORK.
3. J-BOX FOR HAND DRYER. PROVIDED BY CONTRACTOR. VERIFY EXACT ELECTRICAL REQUIREMENTS PRIOR TO COMMENCING ANY WORK.
4. COORDINATE EXACT LOCATION WITH PLUMBER TO CONCEAL CORD BEHIND ELECTRIC DRINKING FOUNTAIN PRIOR TO ANY ROUGH-IN.
5. TIE INTO ROOMS LIGHTING CIRCUIT AND INTERLOCK FAN WITH ROOMS LIGHTS. WIRING SHALL BE 2#10, 1#10G, 3/4"C.
6. PROVIDE A 120V, 20 AMP SPRING WOUND AUTO-OFF WALL TIMER SWITCH, EQUAL TO MFR. INTERMATIC # FF60MHC

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08/14/19

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TITLE:
CITY OF EDINBURG
NORTH PARK SPORT COMPLEX
ELECTRICAL CONCESSION PLAN

55-34'

SCALE: FULL: AS SHOWN
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ELECTRICAL LEGEND-GENERAL

---ALL SYMBOLS SHOWN MAY NOT APPEAR IN ALL DRAWINGS.
SYMBOLS ARE SHOWN SCHEMATIC AND MAY NOT BE TO SCALE.

SYMBOL	DESCRIPTION
	HEAVY DUTY DISCONNECT SWITCH FUSED
	HEAVY DUTY DISCONNECT SWITCH NONFUSED
	HEAVY DUTY COMBINATION DISCONNECT/MOTOR STARTER
	HEAVY DUTY MOTOR STARTER
	ENCLOSED BREAKER, RE: TO SCH. FOR MORE INFO.
R	ROTARY TYPE DISCONNECT SWITCH
M	120/277-208/480V,20AMP, MOTOR RATED SWITCH, NEMA-1(INTERIOR) ENCLOSURE, NEMA-3R(EXTERIOR) ENCLOSURE. VOLTAGE TO BE SELECTED PER EQUIPMENT CIRCUIT REQUIREMENTS.
	MOTOR
	PANELBOARD, CLEARANCE AS PER LATEST NEC
	SWITCH LEG
	ELECTRICAL CONDUIT
	UNDERGROUND ELECTRICAL CONDUIT
	COMMUNICATION CONDUIT AND WIRING
X, X, X	MULTI-POLE DEVICE CIRCUIT NUMBERS
X/X/X	THREE SINGLE POLE DEVICE CIRCUIT NUMBERS
A-1	CONDUIT AND WIRE HOMERUN TO PANEL. SHORT HATCH INDICATES NEUTRAL CONDUCTOR, LONG HATCHES INDICATE PHASE CONDUCTORS, AND LONG HATCH WITH CIRCLE INDICATES ISOLATES OR INSULATED GROUND. ALPHANUMERIC DESCRIPTION INDICATES PANEL AND BREAKER.
A-1	UNDERGROUND CONDUIT AND WIRE HOMERUN TO PANEL. SHORT HATCH INDICATES NEUTRAL CONDUCTOR, LONG HATCHES INDICATE PHASE CONDUCTORS, AND LONG HATCH WITH CIRCLE INDICATES ISOLATED OR INSULATED GROUND. ALPHANUMERIC DESCRIPTION INDICATES PANEL AND BREAKER.
	DETAIL NUMBER
T	SHEET NUMBER
	THERMOSTAT WALL MOUNTED - STUB 1/2"C ABOVE CEILING FROM OUTLET BOX. COORDINATE EXACT LOCATION AND HEIGHT WITH MECHANCIAL DIVISION.
J H-J	JUNCTION BOX - SIZE & MOUNTING AS REQUIRED MINIMUM OF 4" SQUARE
PC	PHOTO CELL(MFR.INTERMATIC #K4136M)
LC	LIGHTING CONTACTOR. REFER TO SCHEDULE/DETAIL
TC	TIME CLOCK REFER TO SCHEDULE/DETAIL
CP-1	CIRCULATING PUMP

ELECTRICAL LEGEND - WIRING DEVICES

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	SINGLE RECEPTACLE - 20A/125V/2P/3W/G NEMA 5-20R
	DUPLEX RECEPTACLE - 20A/125V/2P/3W/G NEMA 5-20R
T	DUPLEX RECEPTACLE TAMPER RESISTANT - 20A/125V/2P/3W/G NEMA 5-20R
H / H	HOSPITAL GRADE DUPLEX RECEPTACLE/GFI - 20A/125V/2P/3W/G NEMA 5-20R
	DUPLEX RCPT. GFI - 20A/125V/2P/3W/G NEMA 5-20R
WP/ "IN-USE"	DUPLEX RCPT.,WEATHER RESISTANT "WR", GFI INSTALLED IN A "IN-USE" WEATHER PROOF STEEL ENCLOSURE- 20A/125V/2P/3W/G NEMA 5-20R WP/"IN-USE" SHALL BE EQUAL TO MFR. CARLON, METALLIC SERIES SINGLE GANG, VERTICAL MOUNT #ME9UVMG DOUBLE GANG, VERTICAL MOUNT #ME9U2VMG
	QUADRAPLEX RECEPTACLE
	ISOLATED GROUND QUADPLEX RECEPTACLE
	ISOLATED GROUND DUPLEX RECEPTACLE - 20A/125V NEMA 5-20R
	208V RECEPTACLE. VERIFY NEMA NO. WITH EQUIPMENT SUPPLIER
	SPECIAL PURPOSE RECEPTACLE (NEMA NO. AS INDICATED)
HD	J-BOX - AIR HAND DRYER: (RECESSED HAND DRYERS TO BE PROVIDED BY DIVISION 16. ELECTRICAL) #B-750 AUTOMATIC HANDCRAFT AS MANUFACTURER BY BOBRICK. (COLOR WHITE) QUANTITY: REFER TO DRAWINGS (MIN. ONE PER LAV. COMPLETE W/ ELE. CONNECTIONS TYP.)
	4-GANG FLOOR MOUNTED BOX, 2-DUPLEX RECEPTACLE(INCLUDE RECEPTACLE WITH COVER PLATE)/2-GANG FOR DATA - FLUSH MOUNTED UNO FLOOR BOX = MFR.-HUBBELL MODEL#CFB4G30CR-24GCVRNK(COVER)-(2)FBMPDUP-FBMP6KS -CFBH82(MULTISERVICE STEEL RECESSED FLOOR BOX-VERIFY FLOOR FINISH PRIOR TO ORDER SAME BOX FOR DATA OUTLETS.
6G	6-GANG FLOOR MOUNTED BOX, 2-DUPLEX RECEPTACLE(INCLUDE RECEPTACLE WITH COVER PLATE)/2-GANG FOR DATA - FLUSH MOUNTED UNO FLOOR BOX = MFR.-HUBBELL MODEL#CFB6G30CR-CFBS1R8CVRALU(COVER)-(3)FBMPDUP-FBMP6KS -CFBH82(MULTISERVICE STEEL RECESSED FLOOR BOX-VERIFY FLOOR FINISH PRIOR TO ORDER SAME BOX FOR DATA OUTLETS.
6P	6" FIRE RATED POKE-TRHOUGHS BOX, 2-DUPLEX RECEPTACLE(INCLUDE RECEPTACLE WITH COVER PLATE)- MFR.-HUBBELL MODEL#S1R6PTFIT-S1R6SPE-S1R6SPL-S1R6SPH(50/50 DEVICE PLATE COMBINATION)-S1R6CVRALU(COVER) -VERIFY FLOOR FINISH PRIOR TO ORDER SAME BOX FOR DATA OUTLETS.
6JP	6" FIRE RATED POKE-TRHOUGHS BOX, FURNITURE FEED,- MFR.-HUBBELL MODEL#S1R6PTFFALU(ALUMINUM COVER) -VERIFY FLOOR FINISH PRIOR TO ORDER.
8P	8" FIRE RATED POKE-TRHOUGHS BOX, 2-DUPLEX RECEPTACLE(INCLUDE RECEPTACLE WITH COVER PLATE)- MFR.-HUBBELL MODEL#S1R8PTFIT3-S1R8CSPK-S1R8CSPK-S1R8PSPZ(50/50 DEVICE PLATE COMBINATION)-S1R8CVRALU(COVER) -VERIFY FLOOR FINISH PRIOR TO ORDER SAME BOX FOR DATA OUTLETS.

ELECTRICAL LEGEND-LIGHTING

---ALL SYMBOLS SHOWN MAY NOT APPEAR IN ALL DRAWINGS.
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SYMBOL	DESCRIPTION
	2'x4' LIGHT FIXTURE, REFER TO LUMINAIRE SCHEDULE
	2'X4' LIGHT FIXTURE W/EMERGENCY BATTERY PACK, REFER TO LUMINAIRE SCHEDULE
	2'x2' LIGHT FIXTURE, REFER TO LUMINAIRE SCHEDULE
	2'X2' LIGHT FIXTURE W/EMERGENCY BATTERY PACK, REFER TO LUMINAIRE SCHEDULE
	1'X4' LIGHT FIXTURE, REFER TO LUMINAIRE SCHEDULE
	TRACK LIGHT WITH HEADS AS INDICATED
	INCANDESCENT, LED, FLUORESCENT, OR HID WALL WASHER LIGHT FIXTURE CEILING MTD, REFER TO LUMINAIRE SCHEDULE
	INCANDESCENT, LED, FLUORESCENT, OR HID FIXTURE CLG. OR WALL MTD, REFER TO LUMINAIRE SCHEDULE
	LED, FLUORESCENT, OR HID FIXTURE WITH EMERGENCY BATTERY PACK. CLG, OR WALL MTD, REFER TO LUMINAIRE SCHEDULE
	EXIT LIGHT, CEILING OR WALL MOUNTED - SHADING INDICATING SINGLE OR DOUBLE FACE; DIRECTIONAL ARROWS AS INDICATED REFER TO LUMINAIRE SCHEDULE
	EXIT LIGHT SAME AS ABOVE, EXCEPT WITH AN EMERGENCY UNIT AS A COMBO, REFER TO LUMINAIRE SCHEDULE
	CEILING FAN
	STRIP UTILITY LIGHT FIXTURE, REFER TO LUMINAIRE SCHEDULE
	STRIP UTILITY STRIP LIGHT WITH EMERGENCY BATTERY PACK. REFER TO LUMINAIRE SCHEDULE
$	WALL SWITCH SPST, 20A,120/277V
$2	DOUBLE POLE TOGGLE SWITCH, 20A/120/277V
$3	3-WAY WALL SWITCH, 20A,120/277V
$4	4-WAY WALL SWITCH, 20A,120/277V
$D	WALL DIMMER SWITCH
$P	WALL SWITCH SPST, 20A,120/277V - PILOT LIGHT SWITCH
$X	WALL SWITCH SPST, 20A,120/277V - KEYED SWITCH, X = 3 OR 4 WAY

ELECTRICAL ABBREVIATIONS:

ABBV:	DESCRIPTION	ABBV:	DESCRIPTION
AFF	ABOVE FINISHED FLOOR	MFR. (S.C.)	MANUFACTURER SHARE CIRCUIT
BFC	BELOW FINISHED CEILING	QRCPT(S)	QUAD RECEPTACLE(S)
C	CONDUIT	RCPT(S)	DUPLEX RECEPTACLE(S)
CB	CIRCUIT BREAKER	CRCPT(S)	I.G. RECEPTACLE(S)
EC	EMPTY CONDUIT	QCRCPT(S)	QUAD I.G. RECEPTACLE(S)
EX	EXISTING	PNL	PANEL
F	FUSE	SO (S.O.)	SPACE ONLY
G	GROUND (EQUIPMENT)	SP	SPARE
GFI	GROUND FAULT INTERRUPTER	ST (S.T.)	SHUNT TRIP
MTD	MOUNT OR MOUNTED	SW	SWITCH
NF	NONFUSED	UF	UNDERFLOOR
NIC	NOT IN CONTRACT	UG	UNDERGROUND
H.D	HEAVY DUTY	UNO(U.N.O.)	UNLESS NOTED OTHERWISE
NL	NIGHT LIGHT	WG	WIRE GUARD
AC	ABOVE COUNTER	WP	WEATHERPROOF
HT.	HEIGHT	XFMR	TRANSFORMER
MTD.	MOUNTING	MB	MAIN BREAKER
FDR.	FEEDER	MLO	MAIN LUGS ONLY
CKT.	CIRCUIT	RMC	RIGID METAL CONDUIT
LTG.	LIGHTING	RNC	RIGID NONMETALLIC CONDUIT
LC	LIGHTING CONTACTOR	EMT	ELECTRICAL METALLIC TUBING CONDUIT
IG	ISOLATED GROUND	S/N	SOLID NEUTRAL
EA.	EACH	AC	ABOVE COUNTER
N1	NEMA-1	AHJ	AHUTHORITY HAVING JURISDICTION
N3R	NEMA-3R	T	TAMPER PROOF
N4X	NEMA-4X		
SS	STAINLESS STEEL		

NOTES:

1.) 48" AFF INDICATES TO TOP OF DEVICE;
1.5" AFF INDICATES TO BOTTOM OF DEVICE;
ALL OTHER MOUNTING HEIGHTS REFER TO CENTERLINE OF DEVICE.
AC INDICATES 6" ABOVE COUNTER TO BOTTOM OF DEVICE.

GENERAL ELECTRICAL NOTES

1. ALL SYMBOLS AND ABBREVIATIONS SHOWN ON THIS LEGEND MAY NOT APPEAR ON THIS SET OF DRAWINGS.
2. USE DIRECTIONAL ARROW ON EXIT SIGNS AS REQUIRED.
3. IEEE STANDARD C37.2-1991, ELECTRICAL POWER SYSTEM DEVICE FUNCTION NUMBERS.
4. CONTRACTOR SHALL NOT INSTALL MORE THAN THREE CURRENT CARRYING CONDUCTORS IN A COMMON RACEWAY. IF CONTRACTOR IS PLANNING ON GROUPING MULTIPLE CIRCUITS IN A SINGLE RACEWAY, THE CONTRACTOR MUST SUBMIT ALL DERATING CALCULATIONS FOR THE PROPOSED INSTALLATION IN ACCORDANCE WITH NEC ARTICLE 310.15 (B) (2) FOR APPROVAL PRIOR TO INSTALLATION. NON APPROVED INSTALLATIONS WILL BE REMOVED AND REINSTALLED BY THE CONTRACTOR IN ACCORDANCE WITH THE NEC AT NO ADDITIONAL COST TO THE OWNER.
5. THERE SHALL NOT BE MORE THAN THE EQUIVALENT OF THREE 90° BENDS (270 DEGREES TOTAL) BETWEEN PULL POINTS. WHERE THERE ARE MORE THAN THREE QUARTER BENDS, CONTRACTOR SHALL PROVIDE PULL BOXES AS SPECIFIED AND SIZED IN ACCORDANCE WITH NEC.
6. COMPLY WITH NEC REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, ALL ELECTRICAL EQUIPMENT AND MATERIAL TO BE APPROVED, LISTED, LABELED, IDENTIFIED AND INSTALLED PER RECOGNIZED ELECTRICAL TESTING LABORATORY.
7. ALL RECEPTACLES, SWITCHES AND JUNCTION BOXES SERVED BY EMERGENCY BRANCH CIRCUITS SHALL BE "RED" IN COLOR. COVERPLATES SHALL BE LABELED IN ACCORDANCE WITH SPECIFICATIONS TO INDICATE PANELBOARD AND CIRCUIT NO. (IE: ET*LA-3).

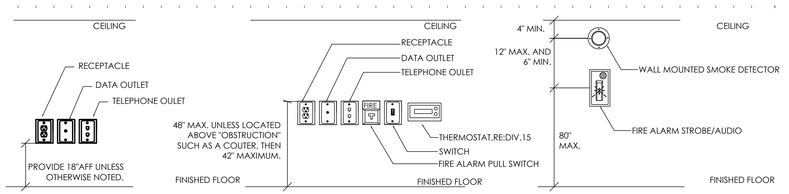
ELECTRICAL: LIGHTING FUNCTIONAL TESTING / COMMISSIONING PLAN:

CONTRACTOR SHALL PERFORM THE TASK BELOW TO COMMISSION THE LIGHTING CONTROL SYSTEM. CONTRACTOR SHALL SUBMIT A DOCUMENTATION DETAILING THE LIGHTING CONTROL SYSTEM, SETTING/CONDITION, ACTIONS PERFORMED AND FINAL SETTING CONDITION. SUBMIT DOCUMENTATION AT OR BEFORE SUBSTANTIAL COMPLETION TO FACILITATE OBTAINING THE CERTIFICATE OF OCCUPANCY.

A. ENSURE ALL LIGHTING FIXTURES FIXTURES HAVE LAMPS INSTALLED AND ARE FUNCTIONAL.
B. TEST ALL EXIT SIGNS, EMERGENCY LIGHTING FIXTURES, AND EMERGENCY BALLASTS FURNISHED INTEGRAL TO FIXTURES.
C. ENSURE ALL OCCUPANCY SENSORS HAVE BEEN INSTALLED AND ARE OPERATIONAL.
D. VERIFY ALL WALLBOX AND SCENE CONTROLLERS ARE INSTALLED AND OPERATIONAL.
E. TEST EACH INDIVIDUAL DEVICE FOR OCCUPANCY SENSOR TYPES OS1, OS2 AND TEST THE LIGHTING CONTROL RELAY PANEL SYSTEM.
F. TEST 10% OF ALL THE DEVICES FOR OCCUPANCY SENSOR TYPE: WSX-PDT-SA.
G. VERIFY THE FOLLOWING:
1. ALL SENSORS ARE LOCATED AND AIMED PER THE MANUFACTURER'S RECOMMENDATIONS.
2. STATUS INDICATORS ON DEVICES ARE OPERATIONAL AND CORRECT.
3. DEVICES CONTROL LIGHTING FIXTURES AS INDICATED ON DRAWINGS.
4. TIME DELAYS HAVE BEEN SET AS PER CODE AND PER OWNERS DIRECTIONS.
5. MOVEMENT IN ADJACENT AREAS AND/ CYCLING OF HVAC SYSTEMS DOES NOT FALSE TRIGGER SENSORS.
6. PHOTOCELL LOCATION AND AIMED PER MANUFACTURERS RECOMMENDATIONS.
7. PROGRAM INTERIOR RELAYS WITH A TIME FUNCTION ACCEPTABLE TO OWNER.
8. PROGRAM INTERIOR OVERRIDE SWITCH WITH A TIME FUNCTIONAL ACCEPTABLE BY OWNER.

MOUNTING HEIGHT DETAIL

NOTE: VERIFY WITH ARCHITECTURAL FOR **ADA REQUIREMENTS.**



SPORTS FIELD LIGHTING SCHEDULE

MARK	VOLTAGE	MOUNTING	DESCRIPTION	LAMP	MODEL NO.	FIX. QUANTITY	MOUNTING HEIGHT
A1,A2	480V	60' POLE	SPORTS LIGHTING SYSTEM	LED 5700K 136,000LM 1170W	(a) MUSCO TLC-LED-1200	3	60'
				LED 5700K 52,000LM 575W	(b) MUSCO TLC-BT-575	1	15.5'
B1,B2	480V	60' POLE	SPORTS LIGHTING SYSTEM	LED 5700K 52,000LM 1430W	(a) MUSCO TLC-LED-1500	4	60'
				LED 5700K 52,000LM 575W	(b) MUSCO TLC-BT-575	1	15.5'

NOTE:
1. REFER TO SPECIFICATION 26 56 58, SPORTS LIGHTING MANUFACTURER SHALL PROVIDE COMPLETE SET OF STRUCTURAL POLE FOUNDATION DRAWINGS DESIGN BY A LICIENSED STRUCTURAL ENGINEER. CONTACT MFR. MUSCO LIGHTING: BRANT TROUTMAN CELL:1-512-914-9500 FOR POLE FOUNDATION INFORMATION FOR MUSCO SYSTEMS.

EXTERIOR LUMINAIRE SCHEDULE

MARK	VOLTAGE	LAMP	MOUNTING	DESCRIPTION	MODEL NO.
A	120V	1-LED FIXTURE 6630 LM 64W 3500K	SURFACE	VAPOR TIGHT LINEAR LED FIXTURE, LISTED FOR WET LOCATIONS	LITHONIA VAP 6000LM PCL MD MVOLT GZ10 35K 80CRI
B	120V	1-LED FIXTURE 6630 LM 44W 3500K	SURFACE	VAPOR TIGHT LINEAR LED FIXTURE, LISTED FOR WET LOCATIONS	LITHONIA VAP 4000LM PCL MD MVOLT GZ10 35K 80CRI
C	120V	1-LED FIXTURE 2009 LM 34W 3500K	SURFACE	2' LENSED LED STRIPLIGHT	LITHONIA ZL2N L24 2000LM MDD MVOLT 35K 80CRI WH
E	120V	INCLUDED	SURFACE	THERMOPLASTIC EMERGENCY LIGHTING UNIT W/ SELF-DIAGNOSTICS	LITHONIA ELM2-SD
AA	208v	1-LED FIXTURE 9155 LM 89W 4000K	16' POLE	LED AREA LUMINAIRE, POLE MOUNT LUMINAIRE, INCLUDE BASE COVER, RATED FOR WET LOCATION, TYPE 2, INCLUDE DRIVER, POLE SHALL BE RATED FOR 120MPH, POLE ANCHORS SHALL BE GALVANIZED.	FIXTURE MFR. INVUE ARB-B3-LED-D1-T2-DP POLE: INVUE#ARP5L316AXX2
AA2	208v	1-LED FIXTURE 9155 LM 99W 4000K 1-LED FLOOD FIXTURE 6590 LM 94W 4000K	16' POLE	LED AREA LUMINAIRE, POLE MOUNT LUMINAIRE, INCLUDE BASE COVER, RATED FOR WET LOCATION, TYPE 5, INCLUDE DRIVER, POLE SHALL BE RATED FOR 120MPH, POLE ANCHORS SHALL BE GALVANIZED. FLOOD LIGHT AIM TO FLAG POLE LOCATED ON BRACKET	FIXTURE MFR. INVUE ARB-B3-LED-D1-T5-DP-ARTA15-XX FLOOD LIGHT#VF5-K-840-5-LED-MST-DP- POLE: INVUE#ARP5L316AXX2
BB	277V	2-LED FIXTURES 43328 LM 782W(391W EACH) 4000K	40' POLE OVERALL 30' POLE ABOVE GND	LED AREA LUMINAIRE, POLE MOUNT LUMINAIRE, INCLUDE BASE COVER, RATED FOR WET LOCATION, TYPE 4 WIDE, DIRECT BURIAL CONCRETE POLE. REFER TO MFR FOR INSTALLATION RECOMMENDATIONS.	FIXTURE MFR. MCGRAW-EDISON GLEON-AF-07-LED-E1-T4W-XX-MA1036-XX-AHD355 POLE MFR. LONESTAR PRESTRESS #351002-T238
CC	120V	1-LED FIXTURE 1308 LM 17W 4000K	SURFACE	LED WALL PACK, RATED FOR WET LOCATION	LITHONIA WSTM LED 2A 40K 120 DDBTXD
DD	277V	1-LED FIXTURE 43328 LM 391W EACH 4000K	SURFACE	LED AREA LUMINAIRE, POLE MOUNT LUMINAIRE, INCLUDE BASE COVER, RATED FOR WET LOCATION, TYPE 4 WIDE, DIRECT BURIAL CONCRETE POLE.	FIXTURE MFR LITHONIA DSXF1 LED P2 40K FL MVOLT IS DNAXD
FF	277V	1-LED FIXTURE 43328 LM 391W EACH 4000K	40' POLE OVERALL 30' POLE ABOVE GND	LED AREA LUMINAIRE, POLE MOUNT LUMINAIRE, INCLUDE BASE COVER, RATED FOR WET LOCATION, TYPE 4 WIDE, DIRECT BURIAL CONCRETE POLE. REFER TO MFR FOR INSTALLATION RECOMMENDATIONS.	FIXTURE MFR. MCGRAW-EDISON GLEON-AF-07-LED-E1-T4W-XX-MA1037-XX-AHD355 POLE MFR. LONESTAR PRESTRESS #351002-T238

1.) EQUAL MANUFACTURER SHALL BE ACCEPTABLE WITH EQUAL PERFORMANCE OF SPECIFIED EQUIPMENT AND APPROVED BY ENGINEER.
2.) SUBMIT EQUAL MANUFACTURERS TO ENGINEER 10 DAYS PRIOR TO BID DATE.
3.) SUBMIT LIGHT FIXTURES CUTSHEETS TO OWNER FOR APPROVAL PRIOR TO ORDER.
4.) CONTRACTOR SHALL VERIFY THAT ANY IRRIGATION SPRINKLER HEAD IS AWAY FROM ANY LIGHT POLE A MINIMUM OF 75' TO AVOID CONSISTENT WATER TO LIGHT POLE. COORDINATE WITH IRRIGATION CONTRACTOR PRIOR TO ANY WORK.
5.) CONTRACTOR SHALL VERIFY THAT ANY LIGHT POLES ON COMMON AREAS AND SIDE WALKS, THAT THE LOCATION OF THE POLE TO MEET THE ADA REQUIREMENTS.
5.) POLE EMBEDMENTS SHALL BE VERIFIED BY A LOCAL CIVIL OR GEOTECHNICAL ENGINEER PRIOR TO PURCHASE.

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Texas Registered Engineering Firm - F10362
Project number: T:\2019\19.2.30\DWGs\19.2.30 ELEC SCH.dwg

08/14/19

STATE OF TEXAS — LEONARDO MUNOZ — 97137 — REGISTERED PROFESSIONAL ENGINEER

FILE NAME:
DATE: 7/3/19
SURVEYED BY:
DESIGNED BY: IF
DRAWN BY: IF
REVISED BY: IP
CHECKED BY: IP

TITLE: CITY OF EDINBURG NORTH PARK SPORT COMPLEX — ELECTRICAL SITE PLAN

55.34'

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD. . EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE: FULL: AS SHOWN; HALF: N.T.S.

TBPE REG. NO. F-13016

DATE: 08/14/19

SHEET NO.: E2.1 OF XX

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DISCONNECT SCHEDULE

LABEL	DESCRIPTION
WH-1	30AMP, 1Ø, 3W, N1,120V, S/N, N.F., H.D. ROTARY TYPE DISCONNECT
ICE MACHINE	30AMP, 1Ø, 3W, N1,120V, S/N, N.F., H.D. ROTARY TYPE DISCONNECT
SCORE BOARD	30AMP, 1Ø, 3W, N3R,208V, S/N, H.D. FUSED DISCONNECT

NOTE: 1. REFER TO BREAKER SIZE FOR FUSE SIZE.
2. REFER TO PANELBOARD FOR DISCONNECT PHASES AND VOLTAGE.

DRY-TYPE TRANSFORMER SCHEDULE

LABEL	TRANSFORMER DESCRIPTION	PRIMARY VOLTAGE FEEDER - 480V, 3Ø	SECONDARY VOLTAGE FEEDER - 120/208V, 3Ø, 4W
TX-LR1	TYPE-DT-3: GENERAL, 45KVA, COPPER WINDINGS,3-PHASE, (P)480V-(S)208/120V,115°RISE,NEMA-3R	4#4, 1#8G IN 1.5"C	4#2/0, 1#6G IN 2"C

NOTE: ALL DRY-TYP TRANSFORMER SHALL BE ENERGY EFFICIENT MODELS AND MEET 2016 ENERGY EFFICIENT REQUIREMENTS..

GENERAL NOTES:

A. PROVIDE GROUND /BONDING AS INDICATED ON THE NATIONAL ELECTRICAL CODE.

B. NAME PLATES SHALL BE PROVIDED FOR ALL ELECTRICAL SWITCH GEAR, PANEL BOARDS, LIGHTING CONTACTORS, LIGHTING CONTROL PANELS, ETC., BY ELECTRICAL CONTRACTOR.

C. NEW ELECTRICAL METERING AND SERVICE EQUIPMENT SHALL BE PROVIDED AND INSTALLED ACCORDING TO THE LOCAL POWER UTILITY CO. AND CITY REQUIREMENTS. VERIFY AND COORDINATE WITH POWER UTILITY CO. AND AHJ BEFORE BID AND INSTALLATION.

D. COMPLY WITH NFPA 70E SAFETY REQUIREMENTS.

E. PANELBOARDS WITH MORE THAN 42 CIRCUITS SHALL BE IN ONE CABINET ENCLOSURE, UNLESS OTHERWISE NOTED.

F. PROVIDE 4"CONCRETE PAD FOR ALL DRY-TYPE TRANSFORMERS.

G. ALL TWO SECTION PANELBOARDS SHALL BE FEED THRU LUGS.

H. CONTRACTOR SHALL BE RESPONSIBLE FOR DELIVERY OF ELECTRICAL SERVICE TO THE NEW BUILDING WITHIN PROJECT SCHEDULE. COORDINATE ALL COST FOR LABOR AND MATERIALS WITH LOCAL ELECTRICAL UTILITY COMPANY PRIOR TO BID. ALL COST ASSOCIATED WITH THE DELIVERY OF ELECTRICAL SERVICE INCLUDING ALL MATERIALS SHALL BE INCLUDED IN BID. TRANSITION OF NEW ELECTRICAL SERVICE SHALL PROCEED IN WEEKENDS OR HOLIDAYS, INCLUDE ALL COST IN BID FOR OVERTIME FROM ELECTRIC UTILITY COMPANY. NO ADDITIONAL PAYMENT WILL BE MADE FOR SERVICE DELIVERY COSTS AFTER CONTRACT HAS BEEN AWARDED.

I. ELECTRICAL SERVICE 480/277V 1000AMPS OR MORE SHALL INCLUDE GROUND FAULT PROTECTION.

J. ELECTRICAL SERVICE 120V THRU 480V 1000AMPS OR MORE SHALL INCLUDE AN ARC REDUCTION MAINTENANCE SWITCH. COORDINATE EXACT LOCATION OF SUCH SWITCH.

K. THE CONTRACTOR SHALL FURNISH AN ARC FLASH HAZARD ANALYSIS STUDY PER NFPA 70E-STANDARD FOR ELECTRICAL SAFETY IN THE WORKPLACE, REFERENCE ARTICLE 130.3 AND ANEEX D.

L. CONTRACTOR SHALL INCLUDE ALL COST TO PROVIDE SHORT CIRCUIT AND PROTECTIVE DEVICE. THE SHORT-CURCUIT AND PROTECTIVE DEVICE COORDINATE STUDIES SHALL BE SUBMITTED TO THE DESIGN ENGINEER PRIOR TO RECEIVING FINAL APPROVAL OF THE DISTRIBUTION EQUIPMENT SHOP DRAWINGS AND/OR PRIOR TO RELEASE OF EQUIPMENT DRAWINGS FOR MANUFACTURING, APPROVAL FROM THE ENGINEER MAY BE OBTAINED FOR PRELIMINARILY SUBMITTAL OF SUFFICIENT STUDY DATA TO ENSURE THAT THE SELECTION OF DEVICE AND CHARACTERISTICS WILL BE SATISFACTORY.

ELECTRICAL RISER DIAGRAM KEYED NOTES:

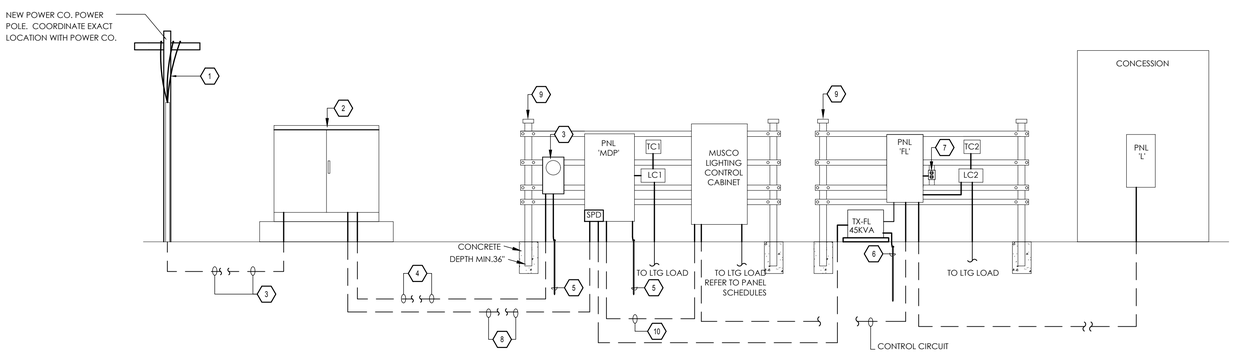
1. NEW POWER COMPANY POLE WITH RISER DIP POLE. COORDINATE WITH POWER COMPANY FOR ALL REQUIREMENTS.
2. POWER COMPANY TRANSFORMER 480/277V, 3Ø, 4W. COORDINATE WITH AEP FOR NEW SECONDARY WIRING. CONTRACTOR SHALL INCLUDE ALL COST FROM AEP FOR THE NEW WORK ON THE SECONDARY SIDE.
3. FURNISH AND INSTALL 1-4"C FOR UTILITY PRIMARY RACEWAY TO POWER SOURCE AS DIRECTED BY UTILITY COMPANY. PROVIDE WARNING RIBBONS 12" ABOVE CONDUIT.
4. PROVIDE 1-2"C WITH PULLSTRING.
5. 1#3/0G IN 1"C, 3/4"X10' COPPER CLAD RODS. PROVIDE GROUNDING AS PER NEC REQUIREMENTS.
6. 1 #6G. GROUND ELECTRODE CONDUCTOR. CALDWELD CONNECTION TO BUILDING REBAR AND STRUCTURE STEEL.
7. WP/"IN-USE GENERAL RECEPTACLE CIRCUIT. CIRCUIT SHALL BE "FL-5" OF PANEL-FL.
8. 1-RUN 4#3/0, 2"C
9. 3"GALVANIZED PIPE WITH UNISTRUT STAND FOR ELECTRICAL SERVICE EQUIPMENT. COORDINATE WITH UTILITY COMPANY PRIOR TO ANY WORK.
10. SPORTS LIGHTING CIRCUITS. REFER TO PANEL SCHEDULES FOR CIRCUITS.

LIGHTING CONTROL SENSORS LEGEND

SYMBOL	ACUITY MODEL NUMBER	CONDUIT	COMMENTS
S OS2	WSX-PDT-SA	3/4"C	

GENERAL NOTES:
A. CONTRACTOR SHALL REFER TO MANUFACTURERS INSTRUCTIONS AND WIRING DIAGRAMS PRIOR TO BID DATE.
B. CONTRACTOR SHALL INCLUDE ALL COST IN BID FOR AN OPERABLE LIGHTING SYSTEM.
NOTES:

1. All sensor locations are approximate, refer to manufacturers installation instructions prior to installation.
2. Ultrasonic ceiling mount sensors should be located a minimum of six feet from HVAC supply/return vents.
3. Contractor is responsible for: proper sensitivity & time delay settings (for non-adaptive products) recommended placement, and field verification of circuits with in respect to power placement.
4. Contractor is responsible for field verification of required number of power packs:
   - One power pack is required for each circuit to be controlled.
   - One power pack is required for every three sensors in the zone.
   - If multiple circuits are to be controlled by a sensor, an auxiliary relay can be used in conjunction with the power pack.
   - The maximum number of sensors that can be put on a power pack is to be reduced by one for each slave pack used.
5. Sensors mounted over the door must be placed one foot inside the threshold.
6. Contractor is responsible for ensuring that the sensor bill of materials complies with the sensor design and layout specifications.
7. Contractor is responsible for installing equipment in compliance with local code.
8. Refer to manufacturers wiring diagrams.
9. Contractor shall include all cost for a manufacturer certified technician to provide a complete training session to owner representatives. Training shall include but not limited to the following; calibrate sensors settings, programming existing conditions and how to add new circuits, trouble shooting, overview of panel and any request from owner. Training may take days: contractor/manufacturer shall include all cost in bid. Contractor shall notify owner/Architect/Engineer on the day for the training. Technician shall calibrate all sensors to owners desire, include cost for technician to provide service after the job is complete.



1 ELECTRICAL SCHEMATIC DIAGRAM
SCALE: NTS

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Project number: T:\2019\19.2.30\DWGs\19.2.30 ELEC SCH.dwg

08/14/19
STATE OF TEXAS
LEONARDO MUNOZ
97652
LICENSED PROFESSIONAL ENGINEER

FILE NAME:
DATE: 7/3/19
SURVEYED BY:
DESIGNED BY: IF
DRAWN BY: IF
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CHECKED BY: IP

55-34'

TITLE: CITY OF EDINBURG NORTH PARK SPORT COMPLEX
ELECTRICAL SITE PLAN

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TBPE REG. NO. F-13016

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SHEET NO.: E3.1 OF XX

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NAME: MDP	AMP	LUGS	NEMA	V(LL)		(P)		(W)		V(LN)	MNT	KAIC	FDR
LOCATION:	200	MB	3	480		3		4		277	SUR.	35	1-RUN 4#3/0, 1#6G, 2"C
LOAD	CKT	LOAD	BKR	POLE	FEEDER/BRANCH CIRCUIT				FEEDER/BRANCH CIRCUIT	POLE	BKR	LOAD	CKT	LOAD
SERVED	#	KVA	SIZE		SIZE	A	B	C	SIZE		SIZE	KVA	#	SERVED
SPARE	1		20	1	-	*			-	1	20		2	SPARE
SPARE	3		20	1	-		*		-	1	20		4	SPARE
SPARE	5		20	1	-			*	-	1	20		6	SPARE
PARKING LTG	7	1.7	20	1	2#10, 1#10G,3/4"C	*			4#4, 1#8G,1 1/2"C	3	75	12	8	PANEL-FL
BASKET BALL LTG	9	0.7	20	1	2#12, 1#12G,1/2"C		*		-			15	10	VIA TX-FL
SIGN LTG	11	0.5	20	1	2#12, 1#12G,1/2"C			*	-			10	12	"
2) PARKING LTG	13	0.7	20	1	2#12, 1#12G,1/2"C	*			2#12, 1#12G,1/2"C	1	20	0.4	14	2) SPLASH LTG
2) FITNESS LTG	15	0.4	20	1	2#12, 1#12G,1/2"C		*		-				16	SPACE
2) SKATING LTG	17	0.4	20	1	2#12, 1#12G,1/2"C			*	-				18	SPACE
SPACE	19				-	*			-				20	SPACE
SPACE	21				-		*		-				22	SPACE
SPACE	23				-			*	-				24	SPACE
B1	25	3	30	3	4#8, 1#10G, 1"C	*			-				26	SPACE
"	27	3			-		*		-				28	SPACE
"	29	3			-			*	-				30	SPACE
B2	31	3	30	3	4#6, 1#8G, 1.25"C	*			4#8, 1#10G, 1"C	3	30	1.8	32	A1
"	33	3			-		*		-			1.8	34	"
"	35	3			-			*	-			1.8	36	"
SPD	37		30	3	4#10, 1#10G,3/4"C	*			4#6, 1#8G, 1.25"C	3	30	1.8	38	A2
"	39				-		*		-			1.8	40	"
"	41				-			*	-			1.8	42	"
LOADS	-	(KVA)				24	26	20				(KVA)	-	DESCRIPTIVE LOADS
CONNECTED LOAD	-	70				KVA/PHASE						34	-	LIGHTING
RESERVE	25	18										0	-	RECEPTACLES
TOTAL LOAD	-	**88**										0	-	COOLING
												0	-	HEATING
TOTAL AMPS	-	**106**										37	-	OTHER

NOTES:
1) PROVIDE INTEGRAL SURGE PROTECTION DEVICE. 160K.
2) SPARE BREAKERS IF ALTERNATE IS NOT ACCEPTED
3)

PANEL-FL	AMP	LUGS	NEMA	V(LL)		(P)		(W)		V(LN)	MNT	KAIC		FDR: 4#2/0, 1#6G,2"C
LOCATION:	200	MB	3	208		3		4		120	SUR.	18		
LOAD	CKT	LOAD	BKR	POLE	FEEDER/BRANCH CIRCUIT				FEEDER/BRANCH CIRCUIT	POLE	BKR	LOAD	CKT	LOAD
SERVED	#	KVA	SIZE		SIZE	A	B	C	SIZE		SIZE	KVA	#	SERVED
SCORE BOARD	1	1.5	30	2	3#6, 1#10G,1"C	*			2#12, 1#12G,1/2"C	1	20	1.5	2	MUSCO CONTROLS
"	3	1.5			-		*		2#3, 1#8G,1.5"C	1	20	1.5	4	SCORE KEEPER QUAD
1 RCPT	5	1.2	20	1	2#12, 1#12G,1/2"C			*	3#3, 1#8G,1.5"C	2	20	0.6	6	TRAIL LTG
SPACE	7				-	*			-			0.6	8	"
PANEL-L	9	6	75	3	4#4, 1#8G,1 1/2"C		*		3#8, 1#10G,3/4"C	2	30	2	10	SPLASH PAD
"	11	5			-			*	-			2	12	"
"	13	6			-	*			3#8, 1#10G,3/4"C	2	30	2	14	SPLASH PAD
1 RCPT	15	1.5	20	1	2#12, 1#12G,1/2"C		*		-			2	16	"
TRAIL LTG	17	0.6	20	2	3#6, 1#10G,1"C			*	-	2	30		18	SPARE
"	19	0.6			-	*			-				20	"
SPACE	21				-		*		-				22	SPACE
SPACE	23				-			*	-				24	SPACE
SPACE	25				-	*			-				26	SPACE
SPACE	27				-		*		-				28	SPACE
SPACE	29				-			*	-				30	SPACE
SPACE	31				-	*			-				32	SPACE
SPACE	33				-		*		-				34	SPACE
SPACE	35				-			*	-				36	SPACE
SPARE	37		20	1	-	*			-	1	20		38	SPARE
SPARE	39		20	1	-		*		-	1	20		40	SPARE
SPARE	41		20	1	-			*	-	1	20		42	SPARE
LOADS	-	(KVA)				12	15	10				(KVA)	-	DESCRIPTIVE LOADS
CONNECTED LOAD	-	37				KVA/PHASE						2	-	LIGHTING
RESERVE	25	9										9	-	RECEPTACLES
TOTAL LOAD	-	**46**										0	-	COOLING
												0	-	HEATING
TOTAL AMPS	-	**127**										26	-	OTHER

NOTES:
1) PROVIDE 150AMP MAIN BREAKER.
2)
3)

PANEL-L	AMP	LUGS	NEMA	V(LL)		(P)		(W)		V(LN)	MNT	KAIC	FDR
LOCATION:	100	MB	3	208		3		4		120	FLU.	10	1-RUN 4#2, 1#8G, 2"C
LOAD	CKT	LOAD	BKR	POLE	FEEDER/BRANCH CIRCUIT				FEEDER/BRANCH CIRCUIT	POLE	BKR	LOAD	CKT	LOAD
SERVED	#	KVA	SIZE		SIZE	A	B	C	SIZE		SIZE	KVA	#	SERVED
LIGHTING	1	0.6	20	1	2#12, 1#12G,1/2"C	*			2#12, 1#12G,1/2"C	1	20	0.4	2	LIGHTING
EXTERIOR LIGHTING	3	0.3	20	1	2#12, 1#12G,1/2"C		*		-				4	SPACE
SPACE	5				-			*	-				6	SPACE
1 RCPT	7	0.6	20	1	2#12, 1#12G,1/2"C	*			2#12, 1#12G,1/2"C	1	20	0.6	8	1 RCPT
WH-1	9	1.5	20	1	2#12, 1#12G,1/2"C		*		2#10, 1#10G,3/4"C			1.2	10	1) EDF
1 RCPT	11	0.6	20	1	2#12, 1#12G,1/2"C			*	2#12, 1#12G,1/2"C	1	20	0.6	12	1 RCPT
1 RCPT	13	0.6	20	1	2#12, 1#12G,1/2"C	*			2#10, 1#10G,3/4"C	1	25	2.4	14	HAND DRYER
HAND DRYER	15	2.4	25	1	2#10, 1#10G,3/4"C		*		-				16	SPACE
1) ICE MAKER	17	1.5	20	1	2#10, 1#10G,3/4"C			*	2#12, 1#12G,1/2"C	1	20	0.6	18	1 RCPT
1 RCPT	19	0.6	20	1	2#12, 1#12G,1/2"C	*			2#12, 1#12G,1/2"C	1	20	0.6	20	3 RCPT
EF-2	21	0.6	20	1	2#12, 1#12G,1/2"C		*		-				22	SPACE
SPACE	23				-			*	2#10, 1#10G,3/4"C	1	25	2.4	24	HAND DRYER
SPARE	25		20	1	-	*			-	1	20		26	SPARE
SPARE	27		20	1	-		*		-	1	20		28	SPARE
SPARE	29		20	1	-			*	-	1	20		30	SPARE
LOADS	-	(KVA)				6	5	6				(KVA)	-	DESCRIPTIVE LOADS
CONNECTED LOAD	-	15				KVA/PHASE						1	-	LIGHTING
RESERVE	25	4										13	-	RECEPTACLES
TOTAL LOAD	-	**20**										0	-	COOLING
												0	-	HEATING
TOTAL AMPS	-	**54**										2	-	OTHER

NOTES:
1) PROVIDE GFCI BREAKER
2)
3)

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08/14/19

STATE OF TEXAS
LEONARDO MUNOZ
97137
LICENSED PROFESSIONAL ENGINEER

FILE NAME:
DATE: 7/3/19
SURVEYED BY:
DESIGNED BY: IF
DRAWN BY: IF
REVISED BY: IP
CHECKED BY: IP

TITLE:
CITY OF EDINBURG
NORTH PARK SPORT COMPLEX
ELECTRICAL SITE PLAN

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
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TBPE REG. NO. F-13016

SCALE: FULL: AS SHOWN
HALF: N.T.S.

TBPE REG. NO. F-13016

DATE: 08/14/19

SHEET NO.:
E4.1 OF XX

58.34'

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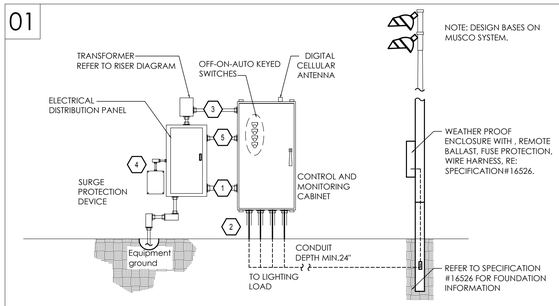
01

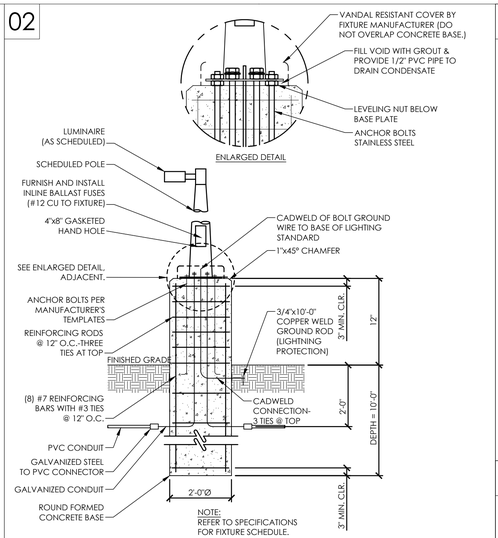


KEYED NOTE	DESCRIPTION	# OF WIRES	TYP. WIRE SIZE (AWG)	MAX. WIRE LENGTH (FT)	WIRE FROM MUSCO
1	LINE POWER & GROUND TO CONTACTORS	NOTE A	NOTE B	27	NO
2	LOAD POWER TO LIGHTING CIRCUITS	NOTE A	NOTE B	N/A	NO
3	CONTROL POWER (DEDICATED, 20A)	3	12	N/A	NO
4	SURGE PROTECTION DEVICE TO DISTRIBUTION PANEL	--	--	N/A	YES
5	SURGE PROTECTION DEVICE MONITORING	2	14	N/A	NO

Notes
A. Voltage and phasing per the notes on cover page
B. Calculate per load and voltage drop
C. All conduit diameters per code.
D. Refer to Control and Monitoring System installation Instructions for more details on equipment information and the installation requirements.
E. Contact (3) and monitoring (5) wiring must be in seperate conduits from line and load power wiring (1,2).

SPORTS LIGHTING ELECTRICAL DETAIL
NO SCALE

02



FIXTURES TYPE - AA/AA2
PARKING LOT LIGHT POLE BASE
NO SCALE

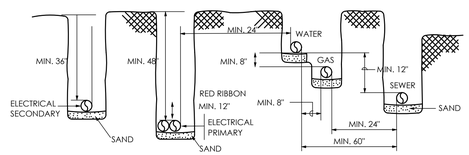
03

CLEAR TRENCH OF ALL ROCKS AND DEBRIS BEFORE ADDING SAND CUSHION.

COMPACT TRENCH FILL TO 95% PROCTOR DENSITY.

MAINTAIN A MINIMUM OF 60 INCHES UNDISTURBED EARTH BETWEEN PARALLEL WATER AND SEWER LINES OR SUPPORT WATER LINE ON SEPARATE SHELF A MINIMUM OF 12" ABOVE SEWER LINE.

MAINTAIN A MINIMUM OF 24" HORIZONTALLY BETWEEN ELECTRICAL PRIMARY AND SEWER. MAINTAIN A MINIM OF 12" VERTICALLY OR 24" HORIZONTALLY BETWEEN ELECTRICAL PRIMARY AND WATER LINES, GAS LINES, TELEPHONE RACEWAYS AND CABLE RACEWAYS.

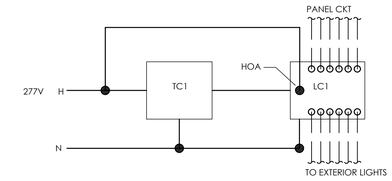


TRENCH DETAIL
NO SCALE

04

LIGHTING CONTACTOR-LC 1
277V, 20AMP, ELEC.HELD.HOA,12-POLE IN A NEMA-3R ENCLOSURE

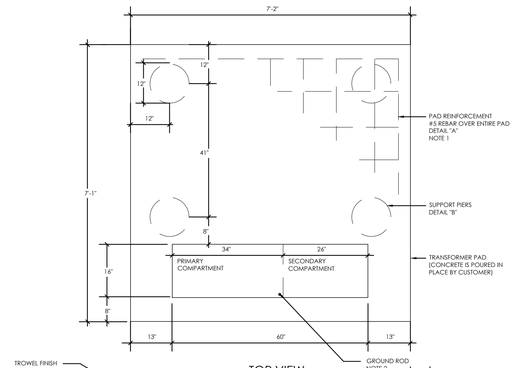
TIME CLOCK - TC1: 277V, 20AMP EQUAL TO MFR.INTERMATIC, MODEL T2000 SERIES IN A NEMA-3R ENCLOSURE.



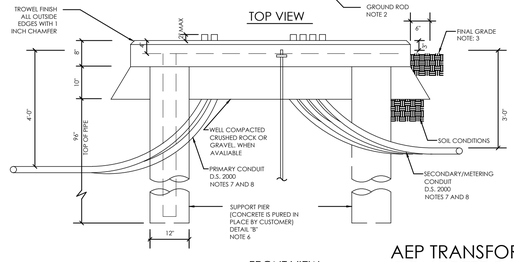
EXTERIOR LIGHTING CONTROL DETAIL
NO SCALE

05

CONCRETE PAD & PIERS FOR THREE PHASE PAD-MOUNTED TRANSFORMER



TOP VIEW



FRONT VIEW

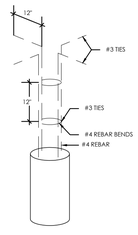
AEP TRANSFORMER CONCRETE PAD DETAIL
NO SCALE

AMERICAN ELECTRIC POWER COMPANY
DISTRIBUTION STANDARDS

NOTE:

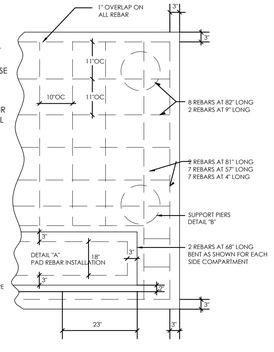
1. SLAB REINFORCEMENT SHALL BE #5 REBARS, ON CENTER (OC) SPACING TO FOLLOW DIMENSIONS SHOWN ON THE DRAWING WITH 4" COVER. REINFORCING BARS SHALL CONFORM TO ASTM A615 GRADE 60. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AFTER 28 DAYS.
2. FOR GROUND ROD PLACMENT, REFER TO DS 2235, 2236, OR 2237.
3. FINAL GRADE SHALL BE ESTABLISHED BEFORE INSTALLATION OF PAD.
4. CONCRETE PAD WITH PIERS IS TO BE INSTALLED OF PAD.
5. PIERS SHALL BE 12" MINIMUM IN DIAMETER, 8 FEET DEEP WITH 4 - #4 VERTICALE REBAR AND #3 TIES AT 12" ON CENTER (O/C), AND PROVIDE A MINIMUM 3" COVER. THE #4 BEND BARS SHOULD BE 12" LONG IN THE HORIZONTAL DIRECTION..
6. PIERS REBAR BENT IN THE HORIZONTAL DIRECTION SO THAT IT MAY TIE IN WITH PAD REBAR.
7. THE NUMBER AND PLACEMENT OF SECONDARY CONDUITS TO BE DETERMINED BY ENGINEERING. CONDUIT MAY EXTEND IN ANY DIRECTION AS REQUIRED BY THE CUSTOMER.
8. BURIAL DEPTH OF CONDUIT IS DEFINED AS THE DISTANCE BETWEEN FINAL GRADE AND THE TOP OF THE CONDUIT. UNLESS OTHERWISE DESIGNATED BY ENGINEERING, CONDUITS SHALL BE INSTALLED AT A BURIAL DEPTH OF NOT LESS THAN 4'-0" AND SECONDARY CONDUITS SHALL BE INSTALLED AT A BURIAL DEPTH OF NOT LESS THAN 3'-0". THESE INITIAL DEPTHS ARE TO ALLOW FOR CHANGES TO THE SURFACE CONDITIONS. LOCAL AGREEMENTS AND CODES MAY REQUIRE ADDITIONAL DEPTH. IF OTHER ARE KNOWN EXTENSIVE CHANGES TO THE FINAL GRADE SUCH THAT THEIR DEPTHS ARE NOT MAINTAINED, CORRECTIVE ACTION SHALL BE TAKEN.

DETAIL - "B" - PIER REBAR INSTALLATION



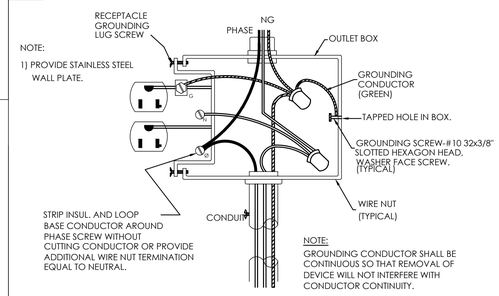
DETAIL - "A" - PAD INSTALLATION

TOP VIEW



CONCRETE PAD AND PIERS FOR THREE PHASE PAD-MOUNTED TRANSFORMERS
HIGH VOLUME CLAY OR SAND TYPE SOIL APPLICATIONS
75KVA - 2500KVA
25KV AND BELOW

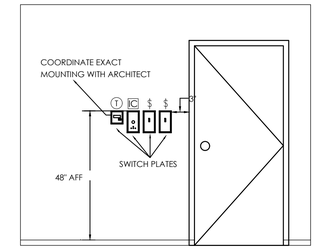
06



TYPICAL RECEPTACLE GROUNDING DETAIL
NO SCALE

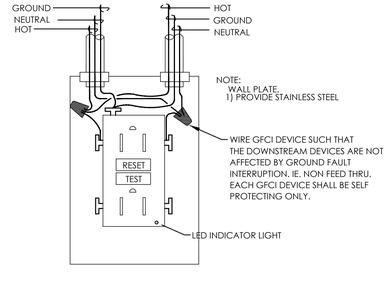
07

NOTE:
VERIFY WITH DIVISION-15 FOR THERMOSTAT LOCATION AND HEIGHT.



SWITCH PLATE LOCATION DETAIL
NO SCALE

08

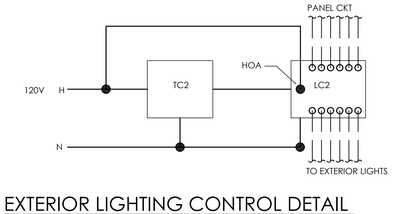


GFI RECEPTACLE- WIRING DIAGRAM
NO SCALE

09

LIGHTING CONTACTOR-LC 2120V, 20AMP, ELEC.HELD.HOA,12-POLE IN A NEMA-3R ENCLOSURE

TIME CLOCK - TC2: 120V, 20AMP EQUAL TO MFR.INTERMATIC, MODEL T2000 SERIES IN A NEMA-3R ENCLOSURE.



EXTERIOR LIGHTING CONTROL DETAIL
NO SCALE

08/14/19

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STATE OF TEXAS
LEONARDO MUNOZ
97157
LICENSED PROFESSIONAL ENGINEER

FILE NAME:
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DESIGNED BY: IF
DRAWN BY: IF
REVISED BY: IP
CHECKED BY: IP

TITLE:
CITY OF EDINBURG
NORTH PARK SPORT COMPLEX
ELECTRICAL SITE PLAN

55.34'

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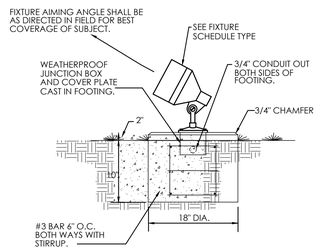
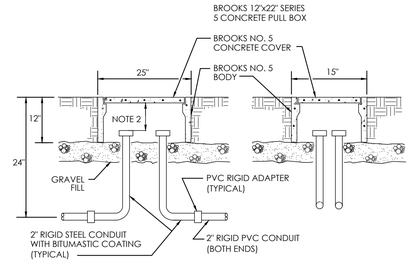
01



LIGHT FIXTURE TYPE-FF MOUNTING DETAIL
NO SCALE

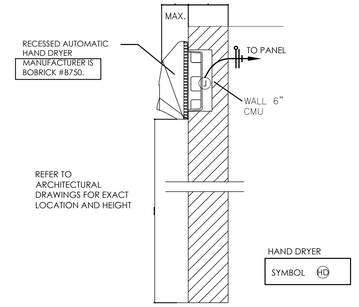
02



NOTES:
1. SEE PLAN FOR CONDUIT ORIENTATION
2. VARIES - MIN. 6", MAX-9"

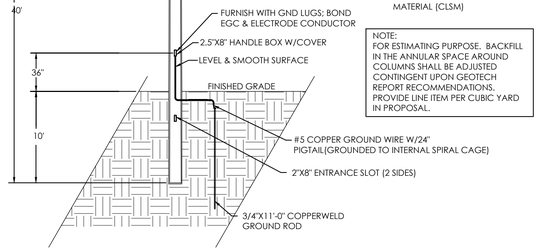
TYPICAL PULLBOX DETAIL
NO SCALE

03



HAND DRYER DETAIL
NO SCALE

04



NOTE:
TOTAL LENGTH FO POLE SHALL BE USED FOR ESTIMATING PURPOSES. TOTAL BURIAL DEPTH OF POLE SHALL BE ADJUSTED BASED ON GEOTECH REPORT AND STRUCTURAL ENGINEER'S RECOMMENDATIONS.

IBC SECTION 1505.7.3 BACKFILL
THE BACKFILL IN THE ANNULAR SPACE AROUND COLUMNS NOT EMBEDDED ON POURED FOOTINGS SHALL BE AS FOLLOWS:
1. BACKFILL SHALL BE OF CONCRETE WITH AN ULTIMATE STRENGTH OF 2,000 PSI AT 28 DAYS. THE HOLE SHALL NOT BE LESS THAN 4 INCHES LARGER THAN THE DIAMETER OF THE COLUMN AT ITS BOTTOM OR 4 INCHES THAN THE DIAGONAL DIMENSION OF A SQUARE OR RECTANGULAR COLUMN.
2. BACKFILL SHALL BE OF CLEAN SAND. THE SAND SHALL BE THOROUGHLY COMPACTED BE TAMPING IN LAYERS NOT MORE THAN 8 INCHES IN DEPTH.
3. BACKFILL SHALL BE OF CONTROLLED LOW STRENGTH MATERIAL (CLSM)

NOTE:
FOR ESTIMATING PURPOSE. BACKFILL IN THE ANNULAR SPACE AROUND COLUMNS SHALL BE ADJUSTED CONTINGENT UPON GEOTECH REPORT RECOMMENDATIONS. PROVIDE LINE ITEM PER CUBIC YARD IN PROPOSAL.

PRE-STRESSED CONCRETE POLE DETAIL
NO SCALE

08/14/19

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STATE OF TEXAS
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TITLE:
CITY OF EDINBURG
NORTH PARK SPORT COMPLEX
ELECTRICAL SITE PLAN

55-34'

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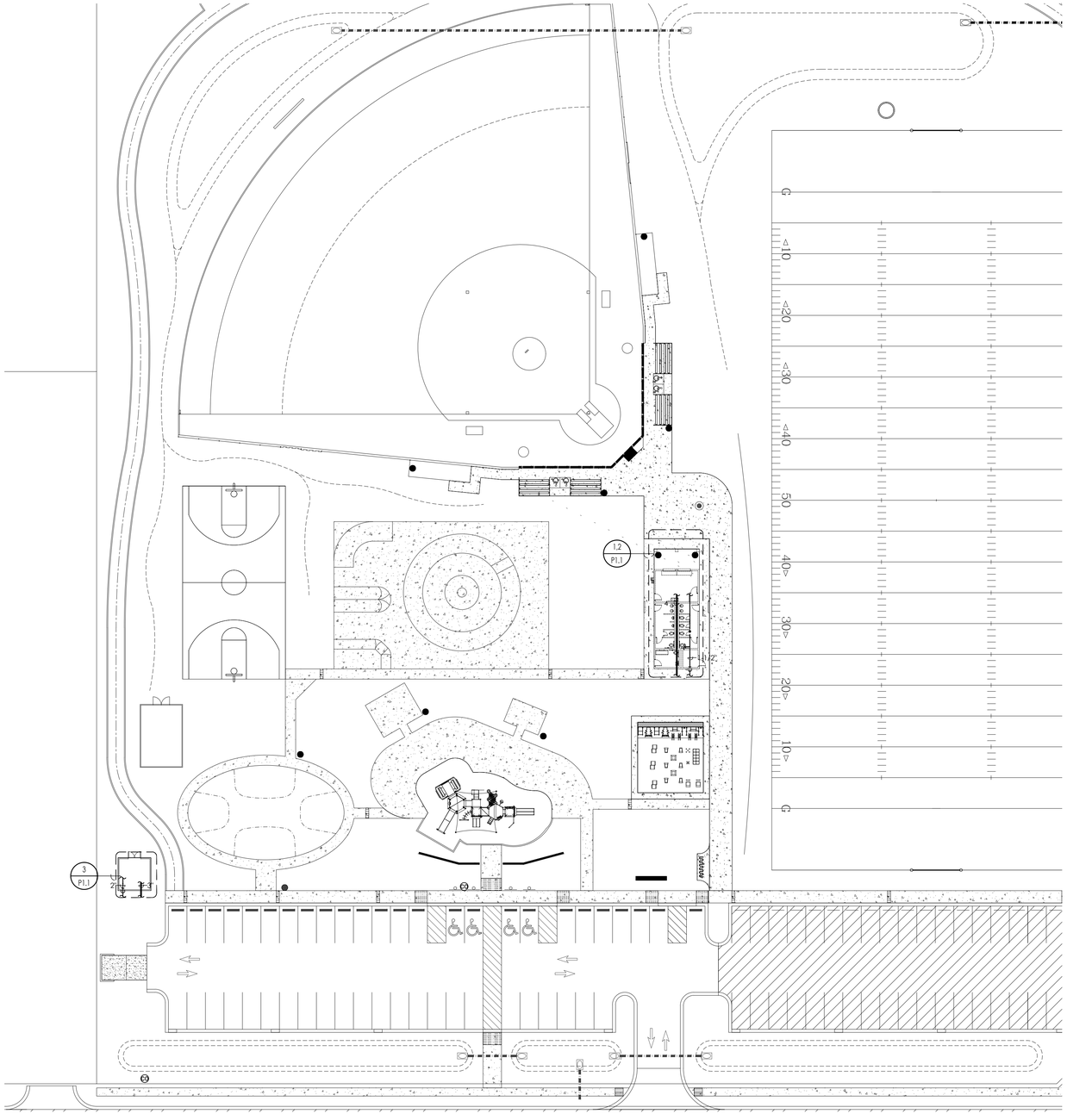

2 PLUMBING SITE PLAN
SCALE: 1"=30'

FILE NAME:	
DATE:	7/3/19
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CHECKED BY:	IP

55.34'

TITLE:

CITY OF EDINBURG
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SCALE:	FULL:	AS SHOWN
	HALF:	N.T.S.

TBPE REG. NO. F-13016

DATE: 08/14/19

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08/14/19

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97257
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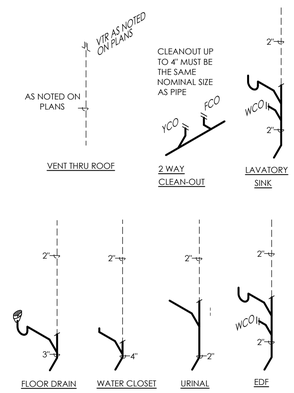
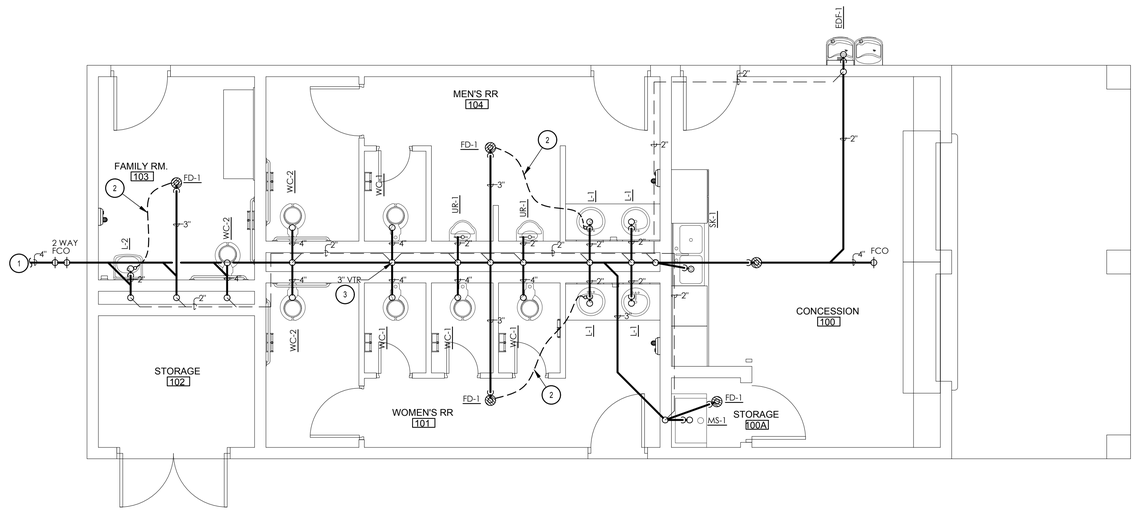


SEWER & VENT
4 TYPICAL RISER SCHEMATICS
NTS

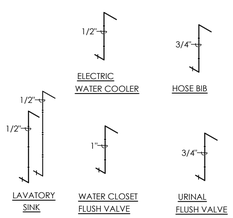


1 PLUMBING SEWER PLAN
SCALE: 1/4"=1'-0"

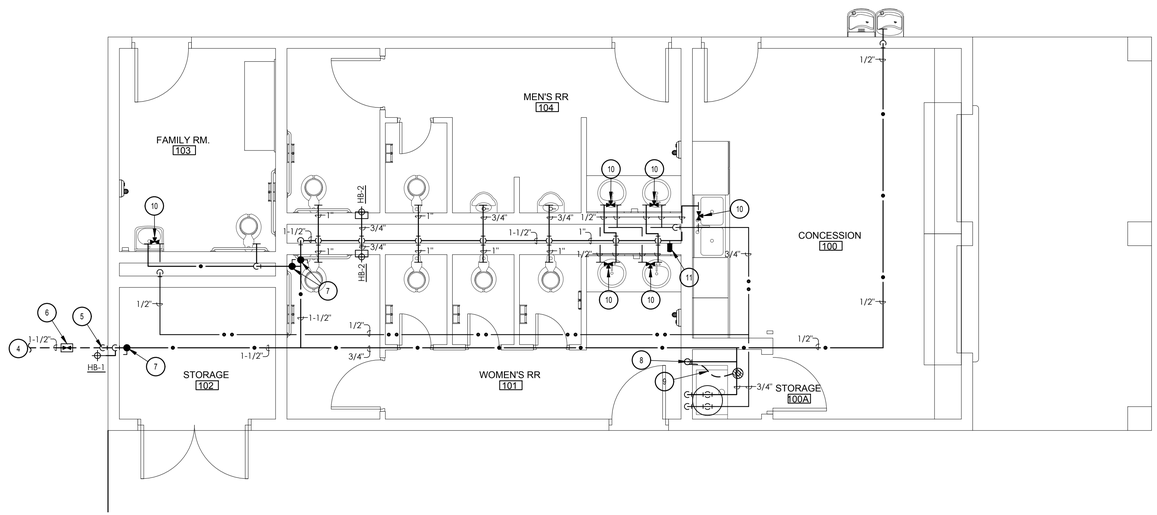
NOTE:
DRAWING IS DIAGRAMMATIC ONLY. CONTRACTOR SHALL COORDINATE EXACT LOCATIONS OF PIPING, DEVICES AND EQUIPMENT WITH BUILDING ELEMENTS AND THE WORK OF OTHER TRADES.

KEYED NOTES: PLUMBING

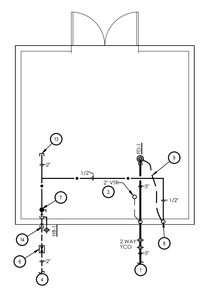
1. REFER TO CIVIL ENGINEERING PLANS FOR CONTINUATION OF PLUMBING FIVE FEET AWAY FROM BUILDING. PLUMBER TO MAKE FINAL CONNECTION TO SEPTIC SYSTEM DRAINAGE FIELD. SIZE AND LOCATION TO BE DETERMINATE BY CIVIL ENGINEER/SEPTIC SYSTEM DESIGNER AS APPROVED BY HIDALGO COUNTY HEALTH DEPARTMENT.
2. 1/2" COPPER FROM TRAP PRIMER. PROVIDE LAVATORY/SINK WITH WATER SAVER TRAP PRIMER. SEE DETAIL 08/P3.1. COVER WITH SLEEVE "POLY SLEEVE" OR EQUAL. TYPICAL FOR ALL TRAP-PRIMERS.
3. KEEP ALL VENT THRU ROOF (VTR) AT LEAST 10 FEET AWAY OR 5 FEET ABOVE FROM ANY FRESH AIR INTAKE COORDINATE LOCATION OF ALL VTRs WITH HVAC CONTRACTOR.
4. REFER TO CIVIL SITE PLAN FOR CONTINUATION OF PLUMBING FIVE FEET AWAY FROM BUILDING. PLUMBING CONTRACTOR TO BE RESPONSIBLE FOR COORDINATION. VERIFICATION AND CONNECTION OF ALL UTILITIES TO SITE UTILITY STUB-OUTS. PROVIDE 1" WATER METER AND BACKFLOW PREVENTER AS REQUIRED.
5. WATER SERVICE ENTRANCE. REFER TO DETAIL 16/P3.1.
6. CUT-OFF VALVE IN CAST IRON BOX. SET BOX FLUSH WITH FINISHED FLOOR.
7. BRONZE CUT-OFF VALVE ABOVE CEILING. PROVIDE ACCESS PANEL WHERE LOCATED IN AN INACCESSIBLE CEILING. PANEL SHALL BE 12"X12" PAINTED TO MATCH CEILING.
8. PRESSURE DROP ACTIVATED TRAP PRIMER MIFAB OR EQUAL. PROVIDE ACCESS PANEL IF INACCESSIBLE. SEE DETAIL 06/P3.1.
9. 1/2" COPPER FROM TRAP PRIMER COVER WITH POLYETHYLENE SLEEVE "POLY SLEEVE" OR EQUAL. TYPICAL ALL TRAP-PRIMERS.
10. PROVIDE SINK/LAV WITH SINGLE OUTLET THERMOSTATIC MIXING VALVE (TMV). WATTS LFMMV-US-M1. SET TEMPERATURE AS PER LOCAL JURISDICTION.
11. WATER HAMMER ARRESTOR (HYDRA-RESTER) ABOVE CEILING. SIOUX CHIEF OR EQUAL FOR FIXTURES IN CHASE. PROVIDE ACCESS PANEL WHERE LOCATED IN AN INACCESSIBLE CEILING. PANEL SHALL BE 12"x12" PAINTED TO MATCH CEILING. WATER HAMMER ARRESTOR, SIZE AS PER MANUFACTURER'S SIZING TABLE.
12. INSTALL WATER HEATER ABOVE MOP SINK. REFER TO DETAIL 01/P3.1.
13. 2" CW CAPPED FOR SPLASH PARK (BY OTHERS).
14. WATER SERVICE ENTRANCE. REFER TO DETAIL 18/P3.1.



DOMESTIC WATER
5 TYPICAL RISER SCHEMATICS
NTS



2 PLUMBING DOMESTIC WATER PLAN
SCALE: 1/4"=1'-0"



3 PLUMBING PUMP ROOM PLAN
SCALE: 1/4"=1'-0"

08/14/19

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55.34'

ABBREV. DESCRIPTION

AC	ABOVE CEILING
AFF	ABOVE FINISHED FLOOR
ASA	AMERICAN STANDARDS ASSOCIATION
ASME	AMERICAN SOICIETY OF MECHANICAL ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING MATERIALS
AW	ACID WASTE
AWWA	AMERICAN WATER WORKS ASSOCIATION
AV	ACID VENT
BTUH	BRITISH THERMAL UNIT PER HOUR
CA	COMPRESSED AIR
CI	CAST IRON
CO	CLEANOUT
CU	COPPER
DN	DOWN
EQ	EQUAL
FCO	FLOOR CLEANOUT
FF	FINISH FLOOR
FG	FINISH GRADE
FH	FIRE HYDRANT
GAL	GALLON(S)
GALV	GALVANIZED
GW	GREASE WASTE
HB	HOSE BIBB
HP	HORESPOWER
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
OC	ON CENTER
RD	ROOF DRAIN(S)
RE:4/P6	REFER TO DETAIL 4 DRAWING P-6
RO	REVERSE OSMOSIS
SD	STORM DRAIN
SPEC	SPECIFICATION
TYP	TYPICAL
UG	UNDERGROUND
UL	UNDERWRITERS LABORATORIES
VTR	VENT THRU ROOF
V	VACUUM
W/	WITH
WCO	WALL CLEAN OUT
YCO	YARD CLEAN OUT

PLUMBING PIPING MATERIAL:

1. SANITARY DRAIN & VENT INSIDE BUILDING BELOW GRADE: SCHEDULE 40 PVC
2. SANITARY DRAIN OUTSIDE BUILDING: SCHEDULE 40 PVC
3. SANITARY DRAIN & VENT INSIDE BUILDING ABOVE GRADE: SCHEDULE 40 PVC
4. SANITARY DRAIN & VENT IN PLENUM CEILING; NO-HUB CAST IRON
5. DOMESTIC HOT & COLD WATER: COPPER, TYPE "L" HARD DRAWN
6. DOMESTIC WATER BELOW GRADE: COPPER, TYPE "K" SOFT ANNEALED
7. DOMESTIC WATER BELOW GROUND OUTSIDE OF BUILDING PIPING 2" SIZE AND SMALLER: COPPER, TYPE "L" HARD DRAWN
8. DOMESTIC WATER BELOW GROUND OUTSIDE OF BUILDING PIPING OVER 2" SIZE: SDR 26 CLASS 160 PVC

PLUMBING FIXTURE SCHEDULE

MARK	FIXTURE TYPE	CONNECTION SIZE San. Sewer	Vent	Cold Water	Hot Water	DESCRIPTION
WC-1	WATER CLOSET STANDARD	4"	2"	1"	-	STAINLESS STEEL, ELONGATED RIM, FLOOR MOUNTED WATER CLOSET WITH 1-1/2" TOP SPUD. ACORN DURA WARE SIPHON JET TOILET MODEL " 2120-T-3-HS" COMPLETE WITH 1.6 GPF, WITH SLOAN "ROYAL" FLUSH MODEL "111" WITH TRAP PRIMER CONNECTION WHERE REQUIRED AND HINGED SEAT.
WC-2	WATER CLOSET HANDICAPPED	4"	2"	1"	-	STAINLESS STEEL, ELONGATED RIM, FLOOR MOUNTED WATER CLOSET WITH 1-1/2" TOP SPUD. ACORN DURA WARE SIPHON JET TOILET MODEL " 2120-T-3-HS" COMPLETE WITH 1.6 GPF, WITH SLOAN "ROYAL" FLUSH MODEL "111" WITH TRAP PRIMER CONNECTION WHERE REQUIRED AND ADA INTEGRAL SEAT TO MEET HANDICAPPED HEIGHT.
UR-1	URINAL STD.& HANDICAPPED REFER TO ARCH'L DWG FOR MOUNTING HEIGHT	3"	2"	3/4"	-	STAINLESS STEEL, WALL HUNG, WITH 3/4" TOP SPUD AND WALL HANGERS, MINIMUM 14" RIM TO WALL DISTANCE, EQUAL TO ACORN DURA WARE MODEL # "2167-T-1-ADA", WITH EXPOSED SLOAN ROYAL "186-1" FLUSH VALVE, WITH APPROVED CARRIER.
L-1	STAINLESS STEEL LAVATORY COUNTER TOP REFER TO ARCH'L DWG FOR MOUNTING HEIGHT	2"	2"	1/2"	-	ELKAY "LUSTERTONE" MODEL LLVR19161 SINGLE BOWL COUNTERTOP LAVATORY. CONCEALED FRONT OVERFLOW, STAINLESS STEEL. COMPLETE WITH INSTALLATION TEMPLATE, FAUCET HOLES ON 4" CENTERS. PROVIDE METERING FAUCET EQUAL TO AMERICAN STANDARD MODEL 1340.225 , PUSH HANDLES, VANDAL RESISTANT, ADA APPROVED. PROVIDE PROTECTIVE COVER ON P-TRAP AND STOPS.
L-2	STAINLESS STEEL LAVATORY WALL HUNG REFER TO ARCH'L DWG FOR MOUNTING HEIGHT	2"	2"	1/2"	-	STAINLESS STEEL, WALL-HUNG LAVATORY WITH CENTER FAUCET HOLE EQUAL TO ACORN DURA WARE MODEL "1953-ADA-H1-LC-TPT-GT". COMPLETE WITH LAVATORY FAUCET "333-665". CHROME PLATED PUSH HANDLE, COLD INDEX ON HANDLE. 2.0 GPM FLOW, ADA APPROVED, WITH CARRIER, AND PROTECTIVE COVER ON P-TRAP.
SK-1	TWO-COMPARTMENT KITCHEN SINK ADA COMPLIANT	2"	2"	1/2"	1/2"	DOUBLE COMPARTMENT STAINLESS STEEL SINK BY ELKAY MODEL GECR 3321 MOUNT WITH STAINLESS STEEL MOUNTING CHANNELS. 18 GAUGE, TYPE 302, CENTERED REAR DRAIN, COMPLETE WITH MOEN TWO-HANDLE KITCHEN FAUCET MODEL NO. 8799, WITH WRIST BLADE HANDLES. COORDINATE KNEE SPACE WITH SINK DRAIN LOCATION FOR ADA COMPLIANCE. PROVIDE PROTECTIVE COVER ON P-TRAP AND STOPS. PROVIDE LKADOS CHROME PLATED BRASS OFFSET TAILPIECE FOR WHEELCHAIR USE.
EDF-1	ELECTRIC WATER COOLER REFER TO ARCH'L DWG FOR MOUNTING HEIGHT	2"	2"	1/2"	-	ELKAY MODEL "VRCTLR(SC)FR8SC", SELF-CONTAINED, BI-LEVEL WALL HUNG ELECTRIC REFRIGERATED, VANDAL RESISTANT, WATER COOLER. UNIT SHALL DELIVER 8 GPH OF 50°F DRINKING WATER AT 90°F AMBIENT AND 80°F INLET WATER. NON-REFRIGERATED UNIT SHALL DELIVER NON-CHILLED DRINKING WATER. UNIT SHALL BE STAINLESS STEEL CONSTRUCTION AND INCLUDE VANDAL-RESISTANT PUSHBUTTON ACTIVATION. COOLER SHALL INCLUDE VANDAL-RESISTANT BUBBLER. RATED FOR INDOOR AND OUTDOOR USE. STAINLESS STEEL CONSTRUCTION PROVIDES VANDAL-RESISTANT ENCLOSURE. CARRIER SYSTEM AND LKAPR188 APRON.
MS-1	MOP SINK FLOOR MOUNTED	3"	2"	1/2"	1/2"	FIAT MODEL NO. TSB3003, 36"X24"X12" TERRAZO MOP SINK, COMPLETE WITH FAUCET MODEL 830-AA, MOP SINK SHALL INCLUDE ALL HOSE BRACKETS, HOSE, AND MOP HANGER, WITH 3" DRAIN WITH STRAINER & DEEP SEAL P-TRAP. PROVIDE WALL GUARD MSG3624.
FD-1	GENERAL DUTY FLOOR DRAIN	3"	2"	-	-	CAST IRON FLOOR DRAIN EQUAL TO WADE "1100". COMPLETE WITH NICKEL BRONZE STRAINER, AND 1/2" TRAP PRIMER CONNECTION.
HB-1	WALL HYDRANT	-	-	3/4"	-	ANTI-SIPHON, FREESELESS, WALL HYDRANT EQUAL TO WOODFORD "B65". COMPLETE WITH CHROME FINISH BOX AND DOOR, OPERATING LOOSE TEE KEY HANDLE, AND 3/4" INLET CONNECTION.
HB-2	WALL FAUCET INTERIOR HOSE BIB	-	-	3/4"	-	WOODFORD MODEL 26 P-3/4" INLET, WITH BACKFLOW PREVENTER AND LOOSE TEE KEY.
FCO	FLOOR CLEANOUT	AS NOTED ON PLANS				MIFAB MODEL "C1100-R-1" ADJUSTABLE FLOOR CLEANOUT, COMPLETE WITH NICKEL BRONZE TOP ASSEMBLY, LACQUERED CAST IRON FLOOR DRAIN WITH ANCHOR FLANGE, AND PRIMARY GASKET SEAL.
YCO	YARD CLEANOUT	AS NOTED ON PLANS				MIFAB MODEL "C-1220" LACQUERED CAST IRON CLEANOUT, THREADED BRONZE PLUG FOR AIR TIGHT SEAL AND STANDARD REINFORCED SATIN FINISHED NICKEL BRONZE ADJUSTABLE TOP ASSEMBLY.
WCO	WALL CLEANOUT	AS NOTED ON PLANS				MIFAB MODEL "C1430-RD" CAST BRONZE CLEANOUT PLUG. COMPLETE WITH STAINLESS STEEL WALL ACCESS COVER AND ANCHOR SCREW. MOUNT 24" A.F.F.

NOTES:

1.) INSULATE ALL WATER AND WASTE PIPING UNDER LAVATORIES WITH HANDY-SHIELD JACKET BY PLUMBEREX.

2.) PROVIDE SINGLE FIXTURE WATER HAMMER ARRESTORS EQUAL TO MINI-RESTER, HYDRA-RESTER SIOUX CHIEF. FOR ALL PLUMBING FIXTURES IN THE WATER SUPPLY SYSTEM.

ELECTRIC WATER HEATER SCHEDULE

DESIG.	STORAGE GALLONS	RECOVERY G.P.H.	DEGREE RISE °F	WATER TEMP. LEAVING	WATER INLET	WATER OUTLET	REMARKS
WH-1	10	10	60°	120°	3/4"	3/4"	BRADFORD WHITE LIGHT DUTY COMMERCIAL WALL HUNG WATER HEATER, MODEL NO. LD-WH12U3-1, 1.5KW, 120V/1Ø, ELECTRIC TANK TYPE.

PLUMBING GENERAL NOTES: (ALL SHEETS)

A. ALL WORK AND MATERIAL SHALL BE IN COMPLIANCE WITH ALL APPLICABLE CODES AS ADAPTED AND AMENDED BY THE INSPECTING AUTHORITIES.

B. ALL PLUMBING WORK SHALL BE INSTALLED SO AS TO AVOID CONFLICT WITH ALL ELECTRICAL WORK, MECH'L WORK AND STRUCTURAL MEMBERS. COORDINATE WITH MECHANICAL, ELEC'L AND STRUCTURAL FOR PROPER CLEARANCES.

C. REFER TO ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR PHASING AND SEQUENCE OF CONSTRUCTION OF WORK.

D. SLEEVE ALL OUTSIDE WALL, FLOOR SLAB, AND GRADE BEAM PENETRATIONS PER DETAILS AND PER CODE.

E. LOCATE ALL PLUMBING VENTS TO ROOF (VTR) SO THAT THEY TERMINATE A MINIMUM OF 1'-0" AWAY FROM ANY VERTICAL SURFACE AND 10'-0" AWAY FROM ANY OUTSIDE AIR INTAKES.

F. RECORD INVERT ELEVATIONS OF ALL YCO'S ON "AS-BUILT" DRAWINGS.

G. MINIMUM 3" WASTE LINE BELOW FLOOR AND MINIMUM 2" WASTE RISER. UNLESS NOTED OTHERWISE (UNO).

S. PLUMBING CONTRACTOR SHALL PAY FOR ALL UTILITY CONNECTIONS FEES, PERMITS, TESTS AND INSPECTIONS. FURNISH 3 COPIES OF INSPECTION CERTIFICATE BEFORE REQUESTING FINAL PAYMENT.

I. PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR PATCHING AND REPAIRING ALL AREAS WHICH ARE DAMAGED BY HIS OPERATIONS.

J. CUTTING OF CONCRETE FLOORS SHALL BE BY MACHINE SAW. HOLES FOR PIPES (WALL OR FLOOR) SHALL BE DONE WITH CORE DRILLING EQUIPMENT WITH PRIOR APPROVAL FROM THE STRUCTURAL ENGINEERS.

K. PRESSURE TEST ALL INSTALLATIONS PRIOR TO CONNECTING EQUIPMENTS.

L. LABEL ALL PIPING PER ANSI STANDARD.

M. PROVIDE PROPER INSULATION ON ALL HOT WATER PIPING, STORM PIPING AND CONDENSATE PIPING.

N. PROVIDE SHUT-OFF VALVES (STOPS) ON ALL ROUGH-INS TO FIXTURES AND EQUIPMENTS.

O. PROVIDE ANY BACK FLOW PREVENTION DEVICE REQUIRED BY CODE OR GOVERNING AUTHORITIES. CONTRACTOR SHALL VERIFY THIS WITH CITY OR LOCAL AGENCIES AND INCLUDE COST OF SAME IN BID. CONTRACTOR TO HAVE BACK FLOWS CERTIFIED.

P. PROVIDE WATER HAMMER ARRESTORS AS INDICATED ON THE DRAWINGS. AIR CHAMBERS NOT AN APPROVED SUBSTITUTE.

Q. ALL EXPOSED PIPING FOR DESIGNATED DISABLED ACCESS FIXTURES SHALL BE COVERED OR OTHERWISE WRAPPED IN ACCORDANCE WITH A.D.A. REQUIREMENTS AND LOCAL AUTHORITY.

R. ALTERNATE MATERIALS NOT IDENTIFIED IN SPECIFICATIONS/DRAWINGS BUT APPROVED BY LOCAL AUTHORITY SHALL BE SUBMITTED TO ARCHITECT AND PLUMBING ENGINEER FOR REVIEW PRIOR TO INSTALLATION.

S. ISOMETRIC DIAGRAMS ARE FOR SIZING PURPOSES ONLY AND SHALL NOT BE USED FOR MATERIAL TAKE-OFFS, OR BE CONSTRUED TO INDICATE ACTUAL SITE INSTALLATION.

T. DRAWING IS DIAGRAMMATIC ONLY. CONTRACTOR SHALL COORDINATE EXACT LOCATIONS OF PIPING, DEVICES AND EQUIPMENT WITH BUILDING ELEMENTS AND THE WORK OF OTHER TRADES.

U. EVERY FLOOR DRAIN, FLOOR SINK OR HUB DRAIN SHALL BE SERVED BY AN AUTOMATIC TRAP PRIMER, UNO.

PLUMBING SYMBOL LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	BALL VALVE		DOMESTIC COLD WATER
	CHECK VALVE		DOMESTIC HOT WATER
	GATE VALVE		DOMESTIC HOT WATER RETURN
	UNION		SANITARY SEWER VENT
	DIRECTION OF FLOW		SANITARY WASTE LINE
	WALL CLEANOUT	140°	140° HOT WATER
	FLOOR CLEANOUT YARD CLEANOUT		SANITARY DIRECTION OF FLOW
	FLOOR SINK		BRANCH - TOP CONNECTION
	FLOOR DRAIN		PIPE RISER
	WALL HYDRANT OR HOSE BIBB		PIPE DROP
WHA	WATER HAMMER ARRESTOR		POINT OF CONNECTION (APPROXIMATED FIELD VERIFY EXACT POINT OF CONNECTION)

NOTE: 1. NOT ALL SYMBOLS USED ON THIS PROJECT
2. INSTALL WATER CLOSET FLUSH VALVE HANDLE TOWARDS WIDER SIDE OF WATER CLOSET OR DOOR OPENING.
3. INSTALL ADA APPROVED FLUSH VALVE HANDLE FOR ADA PLUMBING FIXTURES.

TRINITY
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Texas Registered Engineering Firm - F10362
Project number: T:\2019\19.2.30\DWGs\19.2.30 PLUM.dwg

08/14/19

STATE OF TEXAS
LEONARDO MUNOZ
97127
REGISTERED PROFESSIONAL ENGINEER

FILE NAME:
DATE: 7/3/19
SURVEYED BY:
DESIGNED BY: IF
DRAWN BY: IF
REVISED BY: IP
CHECKED BY: IP

TITLE: CITY OF EDINBURG NORTH PARK SPORT COMPLEX
PLUMBING LEGEND & SCHEDULES

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13306

SCALE: FULL: AS SHOWN
HALF: N.T.S.

TBPE REG. NO. F-13016

DATE: 08/14/19

SHEET NO.: P2.1 OF XX

55.34'

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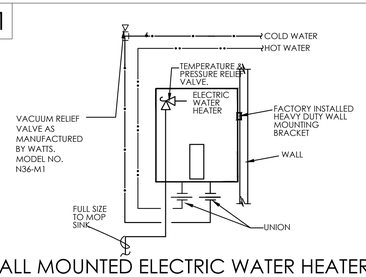
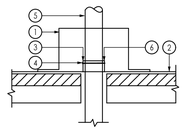
01



WALL MOUNTED ELECTRIC WATER HEATER

NO SCALE

05

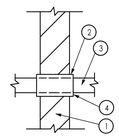


1. PREFABRICATED ROOF CURB, FURNISHED & INSTALLED BY ROOFING CONTR. (COORDINATE)
2. METAL ROOFING
3. STAINLESS STEEL CLAMP
4. SLEEVE PIPE BY ROOFING CONTR.
5. VTR
6. PROVIDE CAULKING GROVE
7. LOCATE MIN. 10'-0" FROM A/C AIR INTAKES

VENT THRU ROOF DETAIL

NO SCALE

09

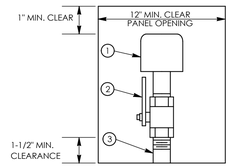


1. MASONRY WALL
2. GALVANIZED SCHEDULE 40 STEEL OR COPPER SLEEVE. SIZE TO BE MINIMUM 3/8" LARGER IN DIAMETER THAN PIPE AND INSULATION.
3. PLUMBING PIPE (RELIER LINES, DOMESTIC WATER, AIR, AND GAS PIPING).
4. FILL VOID WITH MINERAL WOOL AND CAULK VERMIN TIGHT.

WALL SLEEVE DETAIL

NO SCALE

13



1. WATER HAMMER ARRESTOR
2. BALL VALVE, SAME NOMINAL SIZE AS PIPE BRANCH. OPENING IN BALL VALVE TO MATCH PIPE I.D.
3. PIPE SAME SIZE AS BRANCH LINE TO WHICH IT IS ATTACHED.

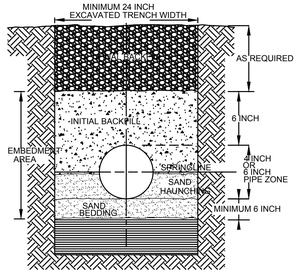
NOTE: PROVIDE REDUCER IF REQUIRED BETWEEN VALVE AND WATER HAMMER ARRESTOR.

DIMENSIONS FOR MIN. PANEL SIZE AND OPENING IF WATER HAMMER ARRESTOR IS LOCATED IN WALL. LOCKING PANEL COLOR TO BE DETERMINED BY ARCHITECT.

WATER HAMMER ARRESTOR DETAIL

NO SCALE

17



UNDERGROUND INSTALLATION OF PLASTIC PIPE

PLASTIC PIPE SHOULD ALWAYS BE BURIED IN STRICT ACCORDANCE WITH THE ASTM STANDARD RELEVANT TO THE TYPE OF PLASTIC PIPING SYSTEM BEING INSTALLED. THOSE STANDARDS ARE:

ASTM D2321 STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY-FLOW APPLICATIONS.

ASTM D2774 STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PRESSURE PIPING.

NOTE: IN ADDITION TO THESE STANDARDS, PIPE SHOULD ALWAYS BE INSTALLED IN ACCORDANCE WITH ALL LOCAL CODE REQUIREMENTS.

RECOMMENDATIONS FOR UNDERGROUND INSTALLATION OF PLASTIC DRAINAGE PIPE:

1. THE MINIMUM WIDTH OF THE TRENCH SHOULD BE THE PIPE OD (OUTSIDE DIAMETER) PLUS 16 INCHES OR THE PIPE OUTSIDE DIAMETER TIMES 1.25 PLUS 12 INCHES. THIS WILL ALLOW ADEQUATE ROOM FOR JOINING THE PIPE, SNAKING THE PIPE IN THE TRENCH TO ALLOW FOR EXPANSION AND CONTRACTION WHERE APPROPRIATE AND SPACE FOR BACKFILLING AND COMPACTION OF BACKFILL. THE SPACE BETWEEN THE PIPE AND TRENCH WALL MUST BE WIDER THAN THE COMPACTION EQUIPMENT USED TO COMPACT THE BACKFILL.
2. PROVIDE A MINIMUM OF 6 INCHES OF FIRM, STABLE AND UNIFORM SAND BEDDING IN THE TRENCH BOTTOM. IF ROCK OR UNYIELDING MATERIAL IS ENCOUNTERED, A MINIMUM OF 8 INCHES OF SAND BEDDING SHALL BE USED. BLOCKING SHOULD NOT BE USED TO CHANGE PIPE GRADE OR TO INTERMITTENTLY SUPPORT PIPE OVER LOW SECTIONS IN THE TRENCH.
3. THE PIPE SHOULD BE SURROUNDED WITH AN AGGREGATE MATERIAL WHICH CAN BE EASILY WORKED AROUND THE SIDES OF THE PIPE. BACKFILLING SHOULD BE PERFORMED IN LAYERS OF 6 INCHES WITH EACH LAYER BEING SUFFICIENTLY COMPACTED TO 85% TO 95% COMPACTION.
4. A MECHANICAL TAMPER IS RECOMMENDED FOR COMPACTING SAND AND GRAVEL. THESE MATERIALS CONTAIN FINE-GRAINS, SUCH AS SILT AND CLAY. IF A TAMPER IS NOT AVAILABLE, COMPACTING SHOULD BE DONE BY HAND.
5. THE TRENCH SHOULD BE COMPLETELY FILLED. THE BACKFILL SHOULD BE PLACED AND SPREAD IN UNIFORM LAYERS TO PREVENT ANY UNFILLED SPACES OR VOIDS. LARGE ROCKS, STONES, FROZEN CLODS, OR OTHER LARGE DEBRIS SHOULD BE REMOVED. STONE BACKFILL SHALL PASS THROUGH AN 1-1/2" SIEVE. ROCK SIZE ONE-TENTH OF THE PIPE OUTSIDE DIAMETER. HEAVY TAMPERS OR ROLLING EQUIPMENT SHOULD BE ABOUT ONLY BE USED TO CONSOLIDATE THE FINAL BACKFILL.
6. TO PREVENT DAMAGE TO THE PIPE AND DISTURBANCE TO PIPE EMBEDMENT, A MINIMUM DEPTH OF BACKFILL ABOVE THE PIPE SHOULD BE MAINTAINED. PIPE SHOULD ALWAYS BE INSTALLED BELOW THE FROST LEVEL. TYPICALLY, IT IS NOT ADVISABLE TO ALLOW VEHICULAR TRAFFIC OR HEAVY CONSTRUCTION EQUIPMENT TO TRAVERSE THE PIPE TRENCH.

UNDERGROUND INSTALLATION DETAIL OF PLASTIC PIPING SYSTEMS

NO SCALE

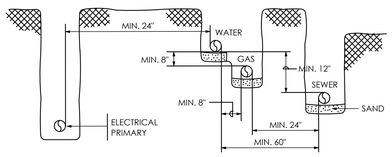
02

CLEAR TRENCH OF ALL ROCKS AND DEBRIS BEFORE ADDING SAND CUSHION.

COMPACT TRENCH FILL TO 95% PROCTOR DENSITY.

MAINTAIN A MINIMUM OF 60 INCHES UNDISTURBED EARTH BETWEEN PARALLEL WATER AND SEWER LINES OR SUPPORT WATER LINE ON SEPARATE SHELF A MINIMUM OF 12" ABOVE SEWER LINE.

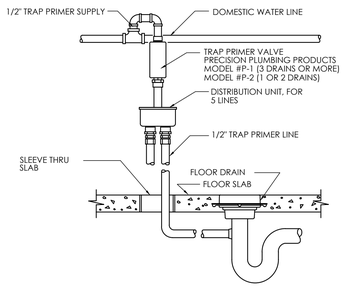
MAINTAIN A MINIMUM OF 24" HORIZONTALLY BETWEEN ELECTRICAL PRIMARY AND SEWER. MAINTAIN A MINIM OF 12" VERTICALLY OR 24" HORIZONTALLY BETWEEN ELECTRICAL PRIMARY AND WATER LINES, GAS LINES, TELEPHONE RACEWAYS AND CABLE RACEWAYS.



TRENCHING DETAIL

NO SCALE

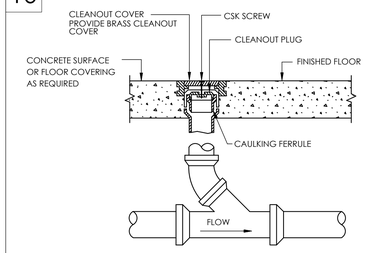
06



TRAP SEAL PRIMER DETAIL

NO SCALE

10

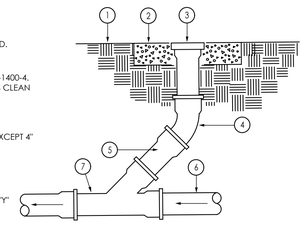


FLOOR CLEANOUT DETAIL

NO SCALE

14

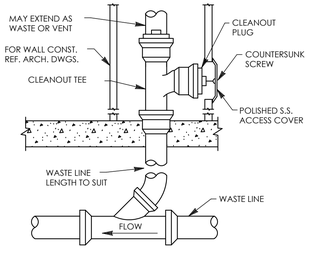
1. GRADE LEVEL
2. 24" X 24" X 6" CONCRETE PAD.
3. CLEANOUT FITTING ZURN ZN-1400-4, (SEE SPECS.) PROVIDE BRASS CLEAN OUT COVER.
4. 1/8 BEND.
5. SAME SIZE AS LINE SERVED EXCEPT 4" MAXIMUM REQUIRED.
6. SEWER LINE.
7. 1/8 BEND (END OF LINE) OR "Y" FITTING.



YARD CLEANOUT DETAIL

NO SCALE

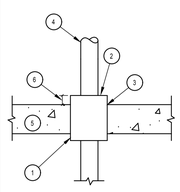
03



WALL CLEANOUT DETAIL

NO SCALE

07

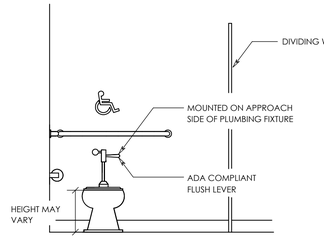


1. METAL SLEEVE TWO SIZES LARGER THAN PIPE
2. FILL VOID WITH NON-SHRINKING WATERPROOF, VERMIN PROOF MATERIAL
3. ALL PLUMBING PIPE PENETRATIONS THROUGH GROUND FLOOR, AND GRADE BEAMS SHALL BE SLEEVED
4. PIPE
5. CONCRETE SLAB
6. MINIMUM 2"

FLOOR PENETRATION DETAIL

NO SCALE

11

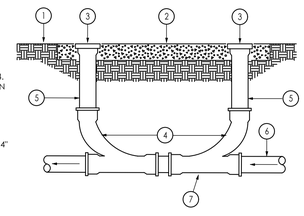


ADA WATER CLOSET DETAIL

NO SCALE

15

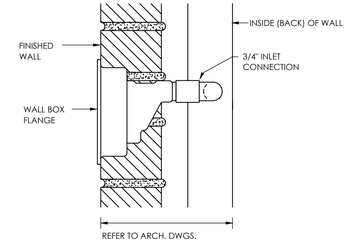
1. GRADE LEVEL
2. 24" X 6" X LENGTH AS REQUIRED CONCRETE PAD.
3. CLEANOUT FITTING ZURN ZN-1400-4, (SEE SPECS.) PROVIDE BRASS CLEAN OUT COVER.
4. LONG SWEEP.
5. SAME SIZE AS LINE SERVED EXCEPT 4" MAXIMUM REQUIRED.
6. SEWER LINE.
7. 1/8 BEND (END OF LINE) OR "Y" FITTING.



2-WAY YARD CLEANOUT DETAIL

NO SCALE

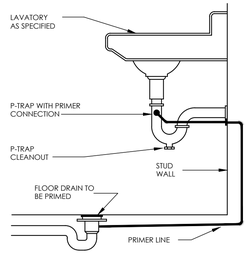
04



WALL HYDRANT DETAIL

NO SCALE

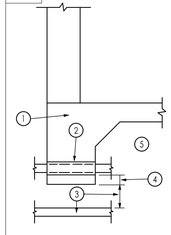
08



TRAP SEAL PRIMER INSTALLATION DETAIL

NO SCALE

12

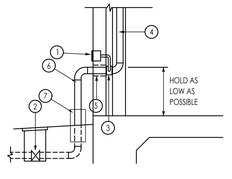


1. GRADE BEAM
2. GALVANIZED SCH 40 STEEL SLEEVE. SIZE PER SPECS. CENTER PIPE IN SLEEVE.
3. PIPING PASSING HORIZONTALLY UNDER GRADE BEAM SHALL BE LOCATED A MINIMUM OF 6" BELOW BEAM. PROVIDE A SLEEVE.
4. PIPING PASSING HORIZONTALLY THROUGH GRADE BEAM SHALL BE LOCATED NO LESS THAN 6" ABOVE BOTTOM OF BEAM.
5. COORDINATE LOCATIONS OF PIPING IN 3,4,5 ABOVE AS RELIEVING ARCHES OR ADDITIONAL CONCRETE MAY BE REQUIRED TO MAINTAIN STRUCTURAL INTEGRITY OF BEAM.

GRADE BEAM SLEEVE DETAIL

NO SCALE

16

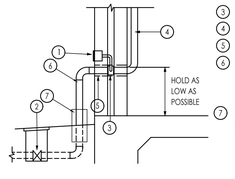


1. WALL HYDRANT - INSTALL LOW ENOUGH TO DRAIN RISER.
2. SHUT-OFF VALE IN CAST IRON BOX FLUSH WITH FINISHED GRADE
3. TEE
4. TYPE "L" COPPER
5. SLEEVE
6. PROVIDE 1" ARMAFLEX INSULATION W/ METAL JACKET ON EXPOSED PIPING.
7. PVC SCH 40 SLEEVE SIZE TO BE MINIMUM 1/2" LARGER IN DIAMETER THAN PIPE AND INSULATION.

WATER SERVICE ENTRANCE DETAIL

NO SCALE

18



1. WALL HYDRANT - INSTALL LOW ENOUGH TO DRAIN RISER.
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WATER SERVICE ENTRANCE DETAIL

NO SCALE

TRINITY
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Project number: T:\2019\19.2.30\DWGs\19.2.30 PLUM.dwg

08/14/19

STATE OF TEXAS
LEONARDO MUNOZ
97137
LICENSED PROFESSIONAL ENGINEER

FILE NAME:
DATE: 7/3/19
SURVEYED BY:
DESIGNED BY: IF
DRAWN BY: IF
REVISED BY: IP
CHECKED BY: IP

55-34'

TITLE: CITY OF EDINBURG NORTH PARK SPORT COMPLEX

PLUMBING DETAILS

SDI ENGINEERING, LLC
CIVIL • TRANSPORTATION • PLANNING • STORMWATER
5602 E. IOWA RD., EDINBURG, TEXAS (956) 287-1818 PH. (956) 287-3697 FAX
INFO@SDI-ENGINEERING.COM
TBPE REG. NO. F-13016

SCALE: FULL: AS SHOWN
HALF: N.T.S.

TBPE REG. NO. F-13016

DATE: 08/14/19

SHEET NO.: P3.1 OF XX

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