

SPECIFICATIONS

City of Edinburg

New Restroom Buildings Edinburg Municipal Park & Dr. Diaz Park

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. 218042

Set No:

PROJECT MANUAL

MAS Project No. 218042 Plans and Specifications

City of Edinburg New Restroom Buildings at Edinburg Municipal Park and Dr. Diaz Park Edinburg, Texas 78541



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

City of Edinburg New Restroom Buildings at Edinburg Municipal Park and Dr. Diaz Park Edinburg, Texas 78541 MAS Project No. 218042

Division	Section Title	Pages
DIVISION	00 - PROCUREMENT AND CONTRACTING REOUIREMENTS	U
	GEOTECHNICAL ENGINEERING STUDY	34
00 52 13	AGREEMENT FORM - STIPULATED SUM	1
00 61 00	PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND	1
00 62 76.1	3 TAX EXEMPT ORGANIZATION CERTIFICATE	1
00 73 00	SUPPLEMENTARY CONDITIONS	4
00 73 43	WAGE RATE REOUIREMENTS	2
	< compared with the second sec	
DIVISION	01 - GENERAL REQUIREMENTS	
01 20 00	PRICE AND PAYMENT PROCEDURES	2
01 21 00	ALLOWANCES	2
01 25 00	SUBSTITUTION PROCEDURES	3
01 30 00	ADMINISTRATIVE REQUIREMENTS	3
01 33 00	SUBMITTALS	4
01 40 00	QUALITY REQUIREMENTS	2
01 50 00	TEMPORARY FACILITIES AND CONTROLS	5
01 77 00	CLOSEOUT PROCEDURES	6
DIVISION	02 – EXISTING CONDITIONS	
DIVISION	1 03 - CONCRETE	
03 30 00	CAST-IN-PLACE CONCRETE	5
DIVISION	1 04 - MASONRY	
04 05 13	MORTAR	3
04 22 00	CONCRETE MASONRY UNIT	5
DIVISION	05 - METALS	
DIVISION	06 - WOOD AND PLASTICS	
06 10 00	ROUGH CARPENTRY	3
DIVISION	07 - THERMAL AND MOISTURE PROTECTION	
07 21 00	BUILDING INSULATION	4
07 21 19	FOAMED IN PLACE MASONRY WALL INSULATION	3
07 26 16	UNDER-SLAB VAPOR BARRIER	3
07 31 13	ASPHALT SHINGLES	6
07 46 46	FIBER CEMENT SIDING	5
07 92 00	JOINT SEALANTS	2
DIVISION	108 - DOORS AND WINDOWS	
08 11 13	HOLLOW METAL DOORS & FRAMES	10
08 71 00	DOOR HARDWARF	0
	LOUVERS AND VENTS	2
		3
DIVISION	09 - FINISHES	
09 91 00	PAINTING AND FINISHING	5

CITY OF EDINBURG NEW RESTROOM BUILDINGS AT EDINBURG MUNICIPAL PARK & DR. DIAZ PARK EDINBURG, TEXAS

100% C.D. CIVIL SPECIFICATIONS

- SECTION 02100 Site Preparation
- SECTION 02102 Clearing and Grubbing
- SECTION 02150 Temporary Erosion and Sediment Control during Construction
- SECTION 02202 Earthwork
- SECTION 02230 Excavation
- SECTION 02270 Grass Seeding For Erosion Control
- SECTION 02514 Concrete Flatwork, Curbs, & Approaches
- SECTION 02660 Water Distribution System
- SECTION 02730 Sanitary Sewerage Utilities
- SECTION 03300 Concrete Work



DIVISION 10 - SPECIALTIES

10 14 00	GRAPHICS AND SIGNAGE	3
10 21 13	TOILET COMPARTMENTS	5
DIVISION	N 11 – EQUIPMENT	
DIVISION	N 12 – FURNISHINGS	
DIVISION	N 13 – SPECIAL CONSTRUCTION	
DIVISION	N 31 – EARTHWORK	
31 10 00	SITE CLEARING, GRADING AND FILLING	3
31 31 16	TERMITE CONTROL	2
DIVISION	N 32 – EXTERIOR IMPROVEMENTS	
32 13 13	CONCRETE PAVING, CURBS AND SIDEWALK	. 10
DIVISION	N 33 – UTILITIES	

END OF TABLE OF CONTENTS



DIVISION 22 – PLUMBING

- 21 01 00 SUMMARY OF PLUMBING WORK
- 22 05 01 COMMON PLUMBING REQUIREMENTS
- 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 13 19 FACILITY SANITARY SEWERS SPECIALTIES
- 22 42 00 PLUMBING FIXTURES
- 22 47 13 ELECTRIC DRINKING FOUNTAIN

DIVISION 23 – HEATING VENTILATION & AIRCONDITIONING

- 23 01 00 SUMMARY OF MECHANICAL WORK
- 23 05 10 BASIC MECHANICAL MATERIALS AND METHODS
- 23 05 29 HANGERS AND SUPPORTS
- 23 05 30 SUPPORTS AND ANCHORS
- 23 05 93 TESTING AND BALANCING
- 23 06 01 MECHANICAL IDENTIFICATION
- 23 26 00 CONDENSATE DRAIN PIPING
- 23 31 00 DUCT ACCESSORIES
- 23 31 13 METAL DUCTS
- 23 34 23 CENTRIFUGAL FANS

DIVISION 26/27/28 - ELECTRICAL

- 26 01 00 SUMMARY OF ELECTRICAL WORK
- 26 01 10 BASIC ELECTRICAL MATERIALS AND METHODS
- 26 01 20 BASIC ELECTRICAL REQUIREMENTS
- 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 29 26 LIGHTING CONTROL SYSTEM
- 26 21 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





3533 Moreland Dr. Suite A | Weslaco, Texas 78596 P: 956.973.0500 | F:956.351.5750 www.trinitymep.com | Copyright 2018 Texas Registered Engineering Firm No. -F10362

26 51 00 INTERIOR LIGHTING 26 56 00 EXTERIOR LIGHTING





NOTICE TO BIDDERS

The City of Edinburg is soliciting sealed Bids to be received by the City Secretary's Office located at 415 W. University, Edinburg, Texas 78541. City of Edinburg normal business days are Monday through Friday between the hours of 7:30 a.m. to 5:30 p.m. and shall be closed on recognized holidays.

Bids will be received until <u>3:00 p.m. Central Time</u>, on <u>Monday, May 20, 2019</u>, shortly thereafter all submitted bids will be gathered and taken to the Edinburg City Hall Community Room, 1st Floor, to be publicly opened and read aloud. Any bid received after the closing time will not be accepted and will be returned to the bidder unopened. It is the responsibility of the bidder to see that any bid submitted shall have sufficient time to be received by City Secretary's Office prior to the bid opening date and time. The receiving time in the City Secretary's Office will be the governing time for acceptability of the bids. Bids will not be accepted by telephone or facsimile machine. All bids must bear original signatures and figures. The Bid shall be for:

BID NO. 2019-80 NEW RESTROOM BUILDINGS AT EDINBURG MUNICIPAL AND DR. DIAZ PARK

If you have any questions or require additional information regarding this bid, please contact <u>LORENA FUENTES</u>, <u>PURCHASING AGENT, LOCATED AT 415 W. UNIVERSITY DRIVE, Edinburg, Tx. 78541 by calling (956) 388-1895</u> or via e- to the following e-mail address:lfuentes@cityofedinburg.com.

<u>If Hand-delivering Bids:</u>	415 West University Dr. c/o City Secretary Department (1 st Floor)
If using Land Courier (i.e., FedEx, UPS):	City of Edinburg c/o City Secretary Department 415 West University Drive Edinburg, Texas 78541
<u>If Mailing Bids:</u>	City of Edinburg c/o City Secretary Department P.O. Box 1079 Edinburg, TX 78540-1079

The City of Edinburg reserves the right to refuse and reject any or all bids and to waive any or all formalities or technicalities and to accept the bid deemed most advantageous to the City, and hold the bids for a period of <u>60</u> days without taking action.

Bids must be submitted in an envelope sealed with tape and prominently marked on the lower left hand corner of the bid envelope with corresponding title.

CITY OF EDINBURG INSTRUCTIONS TO BIDDERS

DEVIATION FROM SPECIFICATION

Please read your specifications/requirements thoroughly and be sure that the <u>SERVICES</u> offered comply with all specifications/requirements. Any variation from the specifications/requirements must be clearly indicated by letter attached to your bid referencing variations on a point-by-point basis. If no exceptions are noted, and you are the successful bidder, it will be required that the <u>SERVICES</u> be provided as specified.

PURPOSE

1. The purpose of these specifications/requirements and bidding documents is for the construction of **NEW RESTROOM BUILDINGS AT EDINBURG MUNICIPAL AND DR. DIAZ PARK.**

2. The <u>SERVICES</u> to be furnished under this bid shall be as specified in these bid documents. All specifications/requirements shown are minimum. There is no intention to disqualify any bidder who can meet these specifications/requirements.

SUBMITTAL OF BID

Bids will be submitted in sealed envelopes upon the blank bid form attached hereto. Submit two (2) complete sets of the bid, one (1) original marked "**ORIGINAL**," and one (1) copy marked "**COPY**". Each bid must be completely filled <u>out and **SUBMITTED IN ORIGINAL FORM**</u>, complete with all supporting documentation. Bids submitted by facsimile (fax) or electronically will **NOT** be accepted. Submittal of a bid in response to this solicitation for Bids constitutes an offer by the Bidder. Bids which do not comply with these specifications/requirements may be rejected at the option of the City. Bids must be filed with the City of Edinburg, before opening day and hour. No late Bids will be accepted. They will be returned to Bidder unopened (if properly identified).

If Hand-delivering Bids:415 West University Drive, c/o City Secretary Department (1st Floor)If using Land Courier (i.e., FedEx, UPS):415 West University Drive, c/o City Secretary Department (1st Floor), Edinburg
Texas 78541If Mailing Bids:P.O. Box 1079, Edinburg, TX 78540-1079

PREPARATION OF BID

Bids MUST give full firm name and address of bidder, and be manually signed. Failure to do so will disqualify your bid. Person signing bid must show title or <u>AUTHORITY TO BIND HIS/HER FIRM IN A CONTRACT</u>.

Firm name and authorized signature must appear on each page that calls for this information. The legal status of the Respondent/Bidder whether corporation, partnership, or individual, shall also be stated in the bid. A corporation shall execute the bid by its duly authorized officers in accordance with its corporate by-laws and shall also list the state in which it is incorporated. A partnership Respondent/Bidder shall give full names and addresses of all partners. All partners shall execute the bid. Partnership and Individual Respondent/Bidder shall state in the bid the names and addresses of all persons with a vested interest therein. The place of residence of each Respondent/Bidder, or the office address in the case of a firm or company, with county and state and telephone number, shall be given after the signature.

ALTERATIONS/AMENDMENTS TO BID

Bids **CANNOT** be altered or amended after opening time. Alterations made before opening time must be initialed by bidder guaranteeing authenticity. No bid may be withdrawn after opening time without acceptable reason in writing and only after approval by the City of Edinburg.

SALES TAX

State sales tax must not be included in the bid.

SUBSTITUTIONS

No substitutions or cancellations will be permitted without written approval of City of Edinburg.

NO BID RESPONSE

If unable to submit a bid, bidder should return inquiry giving reasons.

EXCEPTIONS

Any additions, deletions, or variations from the following specifications/requirements must be noted. The bidder shall attach to his/her bid sheet a list of any exceptions to the specifications/requirements if unable to do so, on specification sheet.

BRAND OR MANUFACTURER REFERENCE

Unless otherwise specified, any catalog or manufacturer's reference or brand name used in describing an item is merely descriptive, and not restrictive, and is used only to indicate type and style of product desired. Bids on alternate brands will be considered if they meet specification requirements. If a bidder quotes on equipment other than the one(s) specified in the bid, sufficient specifications and descriptive (pictured literature) data must accompany same to permit thorough evaluation. In the absence of these qualifications, he/she will be expected to furnish the product called for.

DELIVERY

Number of days required to deliver <u>SERVICES</u> after receiving order must be stated in the bid. Failure to so state will obligate bidder to complete service delivery within <u>ONE</u> day.

DELAY IN SERVICE DELIVERY

When delay can be foreseen, Bidder shall give prior notice to City of Edinburg. Bidder must keep City of Edinburg advised at all times of status of order. Default in promised service delivery (without acceptable reasons) or failure to meet specifications/requirements, authorizes the City of Edinburg to purchase such <u>SERVICES</u> elsewhere and charge increase in cost to defaulting <u>vendor</u>. Acceptable reasons for delayed delivery are as follows: Acts of God (floods, tornadoes, hurricanes, etc.), acts of government, fire, strikes, war; Actions beyond the control of the successful bidder.

SERVICE DELIVERED PRICING

Bids in units of quantity specified - extend and show total. In the event of discrepancies in extension, unit prices will govern. Bids subject to unlimited price increase will not be considered.

VALID BID TIME FRAME

The City may hold bids <u>60</u> days after bid opening without taking action. BIDDERS shall be required to hold their Bids firm for the same period of time.

RIGHT TO REJECT/AWARD

The City of Edinburg reserves the right to refuse and reject any or all Bids, and to waive any or all formalities or technicalities, and to make such awards of contract as may be deemed to be the best and most advantageous to the City of Edinburg.

MULTIPLE VENDOR CONTRACTS

Bidders are advised that the City of Edinburg may award Service Contracts to multiple vendors based on low bid per item basis. All items specified on the "Bid Form" <u>must</u> reflect the individual unit prices. The City of Edinburg reserves the right to award all items individually or in any combination thereof. The City reserves the right to award each item separately or individually, award to one or multiple vendors, and accept the proposal deemed most advantageous to the City.

INDEMNIFICATION CLAUSE

The Bidder agrees to indemnify and save harmless the City, from all suits and actions of every nature and description brought against them or any of them, for or on account of the use of patented appliances, products or processes, and he shall pay all royalties and charges which are legal and equitable. Evidence of such payment or satisfaction shall be submitted upon request of the Purchasing Agent, as a necessary requirement in connection with the final estimate for payment in which such patented appliance, products or processes are used.

ADDENDA

Bidder shall carefully examine the bid forms, specifications/requirements, and instructions to Bidders. Should the bidder find discrepancies in, or omissions from bid forms, specifications/requirements, or other documents, or should he/she be in doubt as to their meaning, he/she should at once notify the Purchasing Agent at 956-388-8972) and obtain clarification by addendum prior to submitting any bid. Explanations, interpretations, and supplemental instructions shall be in the form of written Addenda which shall become a part of the Contract documents. Said Addenda shall be mailed, e-mailed, hand delivered and/or faxed, to all prospective Bidders. All Addenda issued in respect to this project shall be considered official changes to the original bid documents. Verbal statements in response to inquiries and/or requests for explanations shall not be authoritative or binding. It shall be the Bidder(s) responsibility to ensure that they have received all Addenda in respect to this project. Furthermore, Bidders are advised that they must recognize, comply with, and attach a signed copy of each Addendum which shall be made part of the original bid documents. Failure of any bidder to receive any such addendum or interpretation shall not relieve such Bidder from its terms and requirements. The City may issue a written addendum no later than five calendar days prior to the date bids must be received. Addendums are available online at <u>www.cityofedinburg.com</u>.

PAYMENT

The City of Edinburg will execute payment by mail in accordance with the State of Texas Pay Law after <u>SERVICES</u> have been provided and invoiced. No other method of payment will be considered.

<u>SYNONYM</u>

Where in this bid package <u>ITEMS</u> OR <u>SERVICES</u> is used its meaning shall refer to the construction of **NEW RESTROOM BUILDINGS AT EDINBURG MUNICIPAL AND DR. DIAZ PARK** as specified.

ASSIGNMENT

Neither the Bidder's contract nor payment due to an awarded vendor may be assigned to a third party without the written approval of the Purchasing Department for the City of Edinburg.

INTERPRETATIONS

Any questions concerning the conditions and/or specifications/requirements with regards to this solicitation for Bids shall be directed to the designated individuals as outlined in the Request for Bids. Such interpretations, which may affect the eventual outcome of this request for Bids, shall be furnished in writing to all prospective Bidders via

Addendum. No interpretation shall be considered binding unless provided in writing by the City of Edinburg in accordance with paragraph entitled "Addenda".

STATUTORY REQUIREMENTS

It shall be the responsibility of the successful Bidder to comply with all applicable State & Federal laws, Executive Orders and Municipal Ordinances, and the Rules and Regulations of all authorities having jurisdiction over the work to be performed hereunder and such shall apply to the contract throughout, and that they will be deemed to be included in the contract as though written out in full in the contract documents. (To include issues related to health, environmental, and safety to name a few.)

BIDDER'S EMPLOYEES

Neither the Bidder nor his/her employees engaged in fulfilling the terms and conditions of this Purchase Contract shall be considered employees of the City. The method and manner of performance of such undertakings shall be under the exclusive control of the vendor on contract. The City shall have the right of inspection of said undertakings at any time.

RIGHT TO WAIVE

City of Edinburg reserves the right to waive or take exception to any part of these specifications/requirements when in the best interest of the City of Edinburg.

COOPERATIVE PRICING

Bidders are advised that in addition to responding to our "local" solicitation for bids/Bids with Dealer pricing, vendors/contractors are encouraged to provide pricing on the below referenced items/products/services based on BuyBoard, TX-MAS, H-GAC and/or any other State of Texas recognized and approved cooperative which has complied with the bidding requirements for the State of Texas. If bidding other than or in addition to "dealer" pricing, kindly duplicate the bid forms for each bid being provided from a cooperative contract. Any and all applicable fees must be included. All cooperative pricing must be submitted on or before bid opening date and hour.

TIME ALLOWED FOR ACTION TAKEN

The City of Edinburg may hold bids <u>60</u> days after the opening of Bids without taking action. Bidders are required to hold their Bids firm for same period of time.

PREPARATION OF BID

The City of Edinburg shall not be held liable for any costs incurred by any bidder for work performed in the preparation of and production of a bid or for any work performed prior to execution of contract.

CONFIDENTIAL INFORMATION

Any information deemed to be confidential by the bidder should be clearly noted on the pages where confidential information is contained; however, the City cannot guarantee that it will not be compelled to disclose all or part of any public record under Texas Public Information Act, since information deemed to be confidential by the bidder may not be considered confidential under Texas Law, or pursuant to a Court order.

VERBAL THREATS

Any threats made to any employee of the City, be it verbal or written, to discontinue the providing of item/material/services for whatever reason and/or reasons shall be considered a breach of contract and the City will immediately sever the contract with the Vendor on contract.

MATHEMATICAL ERRORS

In the event that mathematical errors exist in any bid, unit prices/rates -v- totals, unit prices/rates will govern.

<u>AUDIT</u>

The City of Edinburg reserves the right to audit the vendor's books and records relating to the performance of this contract. The City of Edinburg, at its own expense, shall have the right at all reasonable times during normal business hours and upon at least twenty-four (24) hours' advance notice, to audit, to examine, and to make copies of or extracts from the books of account and records maintained by the vendor(s) with respect to the Supply/Service and/or Purchase Contract. If such audit shall disclose overpayment by City to vendor, written notice of such overpayment shall be provided to the vendor and the amount of overpayment shall be promptly reimbursed by vendor to the City. In the event any such overpayment is not paid within ten (10) business days after receipt of such notice, the unpaid amount of such overpayment shall bear interest at the rate of one percent (1%) per month from the date of such notice until paid.

PAST PERFORMANCE

Vendor's past performance shall be taken into consideration in the evaluation and award of Service Contract for the Purchase of <u>SERVICES</u>.

JURISDICTION

Contract(s) executed as part of this solicitation shall be subject to and governed under the laws of the State of Texas. Any and all obligations and payments are due and performable and payable in Hidalgo County, Texas.

VENUE

The parties agree that venue for purposes of any and all lawsuits, cause of action, arbitration, and/or any other dispute(s) shall be in Hidalgo County, Texas.

IF YOU HAVE ANY QUESTIONS ABOUT COMPLIANCE, PLEASE CONSULT YOUR OWN LEGAL COUNSEL. COMPLIANCE IS THE INDIVIDUAL RESPONSIBILITY OF EACH PERSON OR AGENT OF A PERSON WHO IS SUBJECT TO THE FILING REQUIREMENT. AN OFFENSE UNDER CHAPTER 176 IS A CLASS "C" MISDEMEANOR.

CONFLICT OF INTEREST

CHAPTER 176 OF THE TEXAS LOCAL GOVERNMENT CODE

Effective January 1, 2006, Chapter 176 of the Texas Local Government Code requires that any vendor or person considering doing business with a local government entity disclose in the Questionnaire Form CIQ, the vendor or person's affiliation or business relationship that might cause a conflict of interest with a local government entity. By law, this questionnaire must be filed with the records administrator of the City of Edinburg not later than the 7th business day after the date the person becomes aware of facts that require the statement 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. For more information or to obtain Questionnaire CIQ visit the Texas Ethics Commission web page at <u>www.ethics.state.tx.us/forms/CIQ.pdf</u>.

CERTIFICATE OF INTERESTED PARTIES (Form 1295)

In 2015, the Texas Legislature adopted <u>House Bill 1295</u>, which added section 2252.908 of the Government Code. The law states that a governmental entity or state agency may not enter into certain contracts with a business entity unless the business entity submits a disclosure of interested parties to the governmental entity or state agency at the time the business entity submits the signed contract to the governmental entity or state agency. The law applies only

to a contract of a governmental entity or state agency that either (1) requires an action or vote by the governing body of the entity or agency before the contract may be signed or (2) has a value of at least \$1 million. The disclosure requirement applies to a contract entered into on or after January 1, 2016. For more information go to the Texas Ethics Commission web page at www.ethics.state.tx.us/forms/CIQ.pdf.

<u>HB 89</u>

The 85th Texas Legislature approved new legislation, effective Sept. 1, 2017, which amends Texas Local Government Code Section 1. Subtitle F, Title 10, Government Code by adding Chapter 2270 which states that a governmental entity may not enter into a contract with a company for goods or services unless the contract contains a written verification from the company that it:

1) does not boycott Israel; and

2) will not boycott Israel during the term of the contract

<u>AWARD</u>

For purposes of this project, award will be contingent on approval of budget.

CONSIDERATION OF LOCATION OF BIDDER'S PRINCIPAL PLACE OF BUSINESS

The City may give local vendors, whose principal place of business is located within the City of Edinburg, and whose bid is within five percent (5%) of the lowest bid price preference as allowed by Section 271.9051 of the Local Government Code.

SPECIAL CIRCUMSTANCES

In the event that the City of Edinburg has an immediate need for a particular service(s) that is/are on contract and the successful vendor on contract is not able to meet the special service delivery needs of the City of Edinburg, the City of Edinburg reserves the right to purchase such services elsewhere to fulfill its' immediate need.

TERMINATION OF CONTRACT

The City of Edinburg reserves the right to terminate the contract if, in the opinion of the City of Edinburg, the successful vendor's performance is not acceptable, if the City is being repeatedly over charged, improperly charged, no funds are available, or if the City wishes, without cause, to discontinue this contract. Termination will be in written form allowing a 30-day notice. The bidder shall be afforded the same right to terminate this contract in the same manner.

STANDARD INSURANCE REQUIREMENTS

Staff may waive insurance requirements for contracts \$0 - \$4,999.99, including but not limited to contracts for food, materials, supplies, and construction. Workers' Compensation in amounts which satisfy statutory coverage shall be required for construction projects.

The following insurance requirements will be included in all City contracts of \$5,000 - \$14,999.99. In contracts not involving building and construction projects, as that activity is defined in TEX. LABOR CODE §406.096, contractors may obtain alternative form of worker accident insurance with minimum limits of liability of \$100,000 per claim.

QUESTIONS AND CLARIFICATIONS

Questions and clarifications that change or substantially clarify the Invitation to Bid will be affirmed in writing and copies will be provided to all firms on record responding to BID. Any inquires to this BID must be submitted to Ms. Lorena Fuentes, Purchasing Agent, at the following email address: <u>Ifuentes@cityofedinburg.com</u> no later than May 13, 2019 at 3:00 p.m.

Minimum Insurance Requirements			
Type of Coverage	Limits of Liability		
Worker's Compensation	Statutory Coverage		
Comprehensive General Liability (City named as additional insured)			
Bodily Injury	\$250,000 each person/\$500,000 each occurrence		
Property Damage	\$100,000 each occurrence/\$100,000 aggregate or \$500,000 combined single limits		

The following insurance requirements will be included in all City contracts of \$15,000 or more.

(1) The successful bidder will be required to carry the following insurance coverage and limits of coverage, as well as list the City as an additional insured to liability coverage as requested by the City. In addition, the successful bidder shall provide the City with evidence of coverage and furnish acceptable proof of payment of insurance premiums.

(2) The successful bidder will be required to secure and/or have insurance coverage in force with an admitted property and casualty insurance company licensed by the State of Texas to conduct business in the State of Texas.

(3) In contracts not involving building and construction projects, as that activity is defined in TEX. LABOR CODE §406.096, contractors may obtain alternative form of worker accident insurance with minimum limits of liability of \$100,000 per claim.

Minimum Insurance Requirements			
Type of Coverage	Limits of Liability		
Worker's Compensation	Statutory Coverage		
Employer's Liability	Bodily Injury by Accident: \$100,000 each accident		
	Bodily Injury by Disease: \$100,000 each employee/\$500,000 policy limit		
Comprehensive General Liability Bodily Injury	\$250,000 each person/\$500,000 each occurrence		
Property Damage	\$100,000 each occurrence/\$100,000 aggregate or \$500,000 combined single limits		
Comprehensive General Liability Bodily Injury	\$100,000 each person/\$500,000 each occurrence		
Property Damage	\$100,000 each occurrence/\$100,000 aggregate or \$500,000 combined single limits		

INSTRUCTIONS TO BIDDERS (Continued):	
City's Protective Liability Bodily Injury	\$250,000 each person/\$500,000 each occurrence
Property Damage	\$100,000 each occurrence/\$100,000 aggregate or \$500,000 combined single limits

Policies must name the City of Edinburg as an Additional Insured.

Certificates of insurance naming the CITY as an additional insured shall be submitted to the CITY for approval prior to any services being performed by Contractor. Each policy of insurance required hereunder shall extend for a period equivalent to, or longer than the term of the Contract, and any insurer hereunder shall be required to give at least thirty (30) days written notice to the CITY prior to the cancellation of any such coverage on the termination date, or otherwise. This Contract shall be automatically suspended upon the cancellation, or other termination, of any required policy of insurance hereunder, and such suspension shall continue until evidence that adequate replacement coverage is provided to the CITY. If replacement coverage is not provided within thirty (30) days following suspension of the Contract, the Contract shall automatically terminate.

BID BOND INFORMATION – CONSTRUCTION PROJECTS ONLY

If the contract amount is over twenty-five-thousand dollars (\$25,000) for construction of the project, the successful bidder shall provide a bid guarantee, give a good and sufficient bond in the full amount of the contract price for the faithful performance of such contract, executed by a surety company authorized to do business in the State of Texas, in accordance with Article 5160, Vernon's Texas Civil Statutes, and amendments thereto. A payment bond in the full amount of the contract price to assure payment shall be required by law of all persons supplying labor and material in the execution of the project provided for in the contract documents.

A bid guarantee equivalent to five percent (5%) of the bid price will be required from each bidder. The "bid guarantee" shall consist of a firm commitment, such as a bid bond, certified check or other negotiable instrument accompanying a bid as assurance that the bidder will upon acceptance of his/her bid, execute such contractual documents as may be required within the time specified.

A performance bond on the part of the contractor for one-hundred percent (100%) of the contract price will be required. A "performance bond" is one executed in connection with a contract to secure fulfillment of all the contractor's obligations under such contract.

A payment bond on the part of the contractor for one-hundred percent (100%) of the contract price will be required. A "payment bond" is one executed in connection with a contract to assure payment, as required by law, of all persons supplying labor and material in execution of the work provided for in the contract documents.

Bidders are expressly advised to review the contract documents fully and insurance requirements of the proposed contract as to their legal requirements and the causes which may lead to the disqualification of a bidder and/or rejection of a bid proposal. No bid may be withdrawn within a period of sixty (60) days after the dated fixed for opening the bids. Unless all bids are rejected, the Owner will give Notice of Award of Contract to the successful bidder as soon as possible consistent with the time for a thorough analysis of bids submitted. Bidders are expected to inspect the site of work and to inform themselves regarding all local conditions which may affect their bid.

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 namedabove, under the provisions of Subtitle F, Title 10, 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:

CITY OF EDINBURG BID FORM FOR NEW RESTROOM BUILDINGS AT EDINBURG MUNICIPAL AND DR. DIAZ PARK

BID NO. 2019-80

BID OPENING DATE: May 20, 2019 at 3:00 p.m.

I/We submit the following bid in **ORIGINAL FORM for <u>NEW RESTROOM BUILDINGS AT EDIN BURG MUNICIPAL</u> <u>AND DR. DIAZ PARK</u> according to City of Edinburg requirements, less tax:**

NOTE: In addition to responding to our "local" solicitation for bids/proposals vendors/contractors are encouraged to provide pricing on the above referenced items/products/services based on Buyboard, H-GAC, TXMAS and/or any other State of Texas recognized and approved cooperative which has complied with the bidding requirements for the State of Texas (any and all applicable fees must be included). All cooperative pricing must be submitted on or before bid/proposal opening date and hour.

CHECK ONE				
□ BUYBOARD □ H-GAC □ TXM □ TX DIR □ TFC □ OTH	AS DEALER/LOCAL			
	Specify			
CONTRACT NUMBER:(If applicable)	_ COMMODITY NUMBER: (If applicable)			

ITEM	ESTIMATED QUANTITIES	DESCRIPTION	BID AMOUNT
1	1 LUMP SUM	NEW RESTROOM BUILDING AT EDINBURG MUNICIPAL PARK(includes septic tank)	\$
2	1 LUMP SUM	ALTERNATE #1: NEW WATER LINE (materials & installation) TO NEW RESTROOM BUILDING AT EDINBURG MUNICIPAL PARK	\$
3	1 LUMP SUM	NEW RESTROOM BUILDING AT EDINBURG DR. DIAZ PARK	\$
		BID TOTAL	\$

Note: The City reserves the right to consider each group as a separate bid and award any or all, whichever may be more advantageous to the City. The City reserves the right to <u>increase</u> or <u>decrease</u> the quantities depending on availability of funds.

CITY OF EDINBURG BID FORM FOR NEW RESTROOM BUILDINGS AT EDINBURG MUNICIPAL AND DR. DIAZ PARK

BID NO 2019-80: NEW RESTROOM BUILDINGS AT EDINBURG MUNICIPAL AND DR. DIAZ PARK

BID OPENING DATE: May 20, 2019 at 3:00 p.m.

I/We submit the following bid in <u>ORIGINAL FORM</u> for NEW RESTROOM BUILDINGS AT EDINBURG MUNICIPAL AND DR. DIAZ PARK according to City of Edinburg requirements, less tax:

All Addenda issued in respect to this project shall be considered official changes to the original bidding documents. It shall be the Bidder(s) responsibility to ensure that all Addenda have been received. Furthermore, bidders are advised that they must recognize, comply with, and attach a signed copy of each Addendum which shall be made part of their Bid Submittal. Bidder(s) signature on Addenda shall be interpreted as the vendor's "recognition and compliance to" official changes as outlined by the City of Edinburg and as such are made part of the original bidding documents.

Does the Company have an office located	d in Edinburg, Texas?	Yes	No
Has the Company ever conducted busine	ess with the City of Edinburg?	Yes	No
Respectfully submitted this day of	, 2019.		
TYPE/PRINT NAME:			
TITLE:			
COMPANY:			
ADDRESS:			
_			
TELEPHONE NO.:			
FAX NO.:			
EMAIL:			

CITY OF EDINBURG REQUEST FOR BIDS FOR NEW RESTROOM BUILDINGS AT EDINBURG MUNICIPAL AND DR. DIAZ PARK

BID NO. 2019-80 New Restroom Buildings at Edinburg Municipal and Dr. Diaz Park

BID OPENING DATE: May 20, 2019 at 3:00 p.m.

It is the intent of this Request for Competitive Sealed Bids to describe and ultimately make it possible for the City of Edinburg to purchase the below mentioned <u>New Restroom Buildings at Edinburg Municipal and Dr. Diaz Park.</u>

GENERAL REQUIREMENTS AND AGREEMENT FOR NEW RESTROOM BUILDINGS AT EDINBURG MUNICIPAL AND DR. DIAZ PARK:

You are invited to submit a sealed bid for the <u>New Restroom Buildings at Edinburg Municipal and Dr. Diaz Park</u> as requested by the City of Edinburg.

The specifications listed below are minimum requirements and are intended to govern, in general, the size and material desired. The City of Edinburg reserves the right to evaluate variations from these specifications.

GENERAL REQUIREMENTS AND AGREEMENT FOR NEW RESTROOM BUILDINGS AT EDINBURG MUNICIPAL AND DR. DIAZ PARK OF ANY COMBINATION:

BID OPENING: All Bids will be opened and publicly read aloud at 3:00 pm, Monday, May 20, 2019 at the Edinburg City Hall Community Room, 1st Floor, located at 415 West University Drive, Edinburg, TX. 78541.

INSPECTION OF SITE: The sites are also accessible for inspection at any time during regular park hours. All contractors proposing to submit competitive sealed bids on this project are strongly encouraged to visit them and assess existing conditions.

BID DOCUMENTS: Copies of the Bid Documents, including Drawings and Project Manual (Bid Requirements & Contract Forms, General Conditions of the Contract for Construction, Specifications) may be downloaded from the City of Edinburg web page address: www.cityofedinburg.com, or may obtain copies of same by contacting the office of: LORENA FUENTES, PURCHASING AGENT, LOCATED AT 415 W. UNIVERSITY DRIVE, Edinburg, TX 78541 by calling (956) 388-1895 or by e-mailing your request to the following e-mail address: Ifuentes@cityofedinburg.com Copies of the Bid Documents are on file at Builders Exchange of Texas, and at the local Associated General Contractors (AGC) and Dodge Plan Rooms.

DRAFT AIA Document A101[™] - 2017

Standard Form of Agreement Between Owner and Contractor

where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year «» (*In words, indicate day, month and year.*)

BETWEEN the Owner: (*Name, legal status, address and other information*)

City of Edinburg 415 W. University Dr. Edinburg, TX. 78539«»

and the Contractor: *(Name, legal status, address and other information)*

« »

for the following Project: (Name, location and detailed description)

New Restroom Buildings at Edinburg Municipal Park and Dr. Diaz Park. Edinburg, TX.»

The Architect: (Name, legal status, address and other information)

«Milnet Architectural Services»«, Professional Limited Liability Company» «608 S. 12th St. McAllen, TX. 78501» «Telephone Number: (956) 688-5656» «Fax Number: (956) 687-9289»

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete Al01[™]-2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201[™]-2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.



ELECTRONIC COPYING of any portion of this AIA[®] Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

TABLE OF ARTICLES

- 1 THE CONTRACT DOCUMENTS
- 2 THE WORK OF THIS CONTRACT
- 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
- 4 CONTRACT SUM
- 5 PAYMENTS
- 6 DISPUTE RESOLUTION
- 7 TERMINATION OR SUSPENSION
- 8 MISCELLANEOUS PROVISIONS
- 9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS



2

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be: *(Check one of the following boxes.)*

[« »] The date of this Agreement.

[« X »] A date set forth in a notice to proceed issued by the Owner.

[« »] Established as follows:

(Insert a date or a means to determine the date of commencement of the Work.)

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:

(Check one of the following boxes and complete the necessary information.)

AIA Document A101[™] - 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 12:14:31 ET on 11/20/2018 under Order No.3580461077 which expires on 11/20/2019, and is not for resale. User Notes: (1197886788) [« »] Not later than » («») calendar days from the date of commencement of the Work.

[**« X »**] By the following date: «August 12, 2019 »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

	Portion of Work	Substantial Completion Date			
§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.					
ARTICLE 4 CONTRACT SUM § 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » (\$ « »), subject to additions and deductions as provided in the Contract Documents.					
 § 4.2 Alternates § 4.2.1 Alternates, if any, included in the Contract Sum: 					
	Item	Price			
§ 4.2.2 Su execution (Insert bei	§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement. (<i>Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.</i>)				
	Item	Price	Conditions for Acceptance		
§ 4.3 Allowances, if any, included in the Contract Sum: (Identify each allowance.)					
§ 4.4 Unit prices, if any: (Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)					
3 4.4 Onld <i>(Identify the control of the control </i>	t prices, if any: <i>he item and state the unit price and quantity</i>	limitations, if any, to which the	unit price will be applicable.)		
3 4.4 Only <i>(Identify t.</i>	t prices, if any: <i>he item and state the unit price and quantity</i> Item	limitations, if any, to which the Units and Limitations	unit price will be applicable.) Price per Unit (\$0.00)		
3 4.4 Onld (Identify th	t prices, if any: <i>he item and state the unit price and quantity</i> Item	limitations, if any, to which the Units and Limitations	unit price will be applicable.) Price per Unit (\$0.00)		
§ 4.5 Liqu (<i>Insert ter</i>)	t prices, if any: <i>he item and state the unit price and quantity</i> Item uidated damages, if any: <i>rms and conditions for liquidated damages, ij</i>	<i>limitations, if any, to which the</i> Units and Limitations <i>f any.)</i>	unit price will be applicable.) Price per Unit (\$0.00)		
§ 4.4 Onti (Identify ta § 4.5 Liqu (Insert ter « »\$250.0 stipulated	t prices, if any: <i>he item and state the unit price and quantity</i> Item idated damages, if any: <i>ms and conditions for liquidated damages, ij</i> 0 per calendar day for each and every calend in the Contract for substantial completion of	<i>limitations, if any, to which the</i> Units and Limitations <i>f any.)</i> lar day that the Contractor shall f the work.	unit price will be applicable.) Price per Unit (\$0.00) be in default after the time		

« »

AIA Document A101[™] - 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 12:14:31 ET on 11/20/2018 under Order No.3580461077 which expires on 11/20/2019, and is not for resale. User Notes: (1197886788)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the « twenty-fifth » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the 21^{st} » day of the « following» month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « forty » (« 40 ») days after the Architect receives the Application for Payment.

(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201[™]–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- .1 That portion of the Contract Sum properly allocable to completed Work;
- .2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- .3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- .5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

« 5% »

AIA Document A101[™] - 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 12:14:31 ET on 11/20/2018 under Order No.3580461077 which expires on 11/20/2019, and is not for resale. User Notes: (1197886788)

§ 5.1.7.1.1 The following items are not subject to retainage:

(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

« »

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:

(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:

(Insert any other conditions for release of retainage upon Substantial Completion.)

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

« »

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

(Insert rate of interest agreed upon, if any.)

« » % « »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker. (If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

AIA Document A101[™] - 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 12:14:31 ET on 11/20/2018 under Order No.3580461077 which expires on 11/20/2019, and is not for resale. User Notes: (1197886788)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows: *(Check the appropriate box.)*

[« »] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[**«X** »] Litigation in a court of competent jurisdiction

[« »] Other (Specify)

« »



6

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows: (Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

« »

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:

(Name, address, email address, and other information)

§ 8.3 The Contractor's representative:

(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101TM–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101[™]−2017 Exhibit A, and elsewhere in the Contract Documents.

« »

§ 8.7 Other provisions:

AIA Document A101TM - 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 12:14:31 ET on 11/20/2018 under Order No.3580461077 which expires on 11/20/2019, and is not for resale. User Notes: (1197886788)

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS § 9.1 This Agreement is comprised of the following documents: .1 AIA Document A101TM–2017, Standard Form of Agreement Between Owner and Contractor .2 AIA Document A101TM–2017, Exhibit A, Insurance and Bonds .3 AIA Document A201TM–2017, General Conditions of the Contract for Construction .4 « » .5 Drawings Number Title Date See attached List of Drawings .6 Specifications Section Title Date Pages See attached Table of Contents .7 Addenda, if any: Number Date Pages Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9. .8 Other Exhibits: (Check all boxes that apply and include appropriate information identifying the exhibit where required.) (« »] AIA Document E204TM–2017, Sustainable Projects Exhibit, dated as indicated below: (Insert the date of the E204-2017 incorporated into this Agreement.) « » [« »] The Sustainability Plan: Title Pages Date [« »] Supplementary and other Conditions of the Contract:

Document Title Date Pages

.9 Other documents, if any, listed below:

(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201TM_2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

« »

AIA Document A101[™] - 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 12:14:31 ET on 11/20/2018 under Order No.3580461077 which expires on 11/20/2019, and is not for resale. User Notes: (1197886788)

This Agreement entered into as of the day and year first written above.

OWNER (Signature)

(Printed name and title)

CONTRACTOR (Signature) (Printed name and title)

AIA Document A101[™] - 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 12:14:31 ET on 11/20/2018 under Order No.3580461077 which expires on 11/20/2019, and is not for resale. User Notes: (1197886788)

RAFT AIA Document A201[™] - 2007

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

THE OWNER:

(Name, legal status and address)

THE ARCHITECT:

(Name, legal status and address)

TABLE OF ARTICLES

- **GENERAL PROVISIONS** 1
- 2 OWNER
- CONTRACTOR 3
- Δ ARCHITECT
- SUBCONTRACTORS 5
- CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS 6
- 7 CHANGES IN THE WORK
- TIME 8
- PAYMENTS AND COMPLETION 9
- 10 PROTECTION OF PERSONS AND PROPERTY
- INSURANCE AND BONDS 11
- 12 UNCOVERING AND CORRECTION OF WORK
- 13 **MISCELLANEOUS PROVISIONS**
- 14 TERMINATION OR SUSPENSION OF THE CONTRACT
- 15 **CLAIMS AND DISPUTES**



The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.





ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

INDEX

(Topics and numbers in **bold** are section headings.)

Acceptance of Nonconforming Work 9.6.6, 9.9.3, 12.3 Acceptance of Work 9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3 Access to Work 3.16, 6.2.1, 12.1 Accident Prevention 10 Acts and Omissions 3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5, 10.2.8, 13.4.2, 13.7, 14.1, 15.2 Addenda 1.1.1.3.11.1 Additional Costs, Claims for 3.7.4, 3.7.5, 6.1.1, 7.3.7.5, 10.3, 15.1.4 **Additional Inspections and Testing** 9.4.2, 9.8.3, 12.2.1, 13.5 Additional Insured 11.1.4 Additional Time, Claims for 3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, 15.1.5 **Administration of the Contract** 3.1.3, 4.2, 9.4, 9.5 Advertisement or Invitation to Bid 1.1.1 Aesthetic Effect 4213 Allowances 3.8, 7.3.8 All-risk Insurance 11.3.1, 11.3.1.1 **Applications for Payment** 4.2.5, 7.3.9, 9.2, 9.3, 9.4, 9.5.1, 9.6.3, 9.7, 9.10, 11.1.3 Approvals 2.1.1, 2.2.2, 2.4, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10, 4.2.7, 9.3.2, 13.5.1 Arbitration 8.3.1, 11.3.10, 13.1.1, 15.3.2, 15.4 ARCHITECT 4 Architect, Definition of 4.1.1 Architect, Extent of Authority 2.4.1, 3.12.7, 4.1, 4.2, 5.2, 6.3, 7.1.2, 7.3.7, 7.4, 9.2, 9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1, 13.5.1, 13.5.2, 14.2.2, 14.2.4, 15.1.3, 15.2.1 Architect, Limitations of Authority and Responsibility 2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4, 9.4.2, 9.5.3, 9.6.4, 15.1.3, 15.2 Architect's Additional Services and Expenses 2.4.1, 11.3.1.1, 12.2.1, 13.5.2, 13.5.3, 14.2.4

Architect's Administration of the Contract 3.1.3, 4.2, 3.7.4, 15.2, 9.4.1, 9.5 Architect's Approvals 2.4.1, 3.1.3, 3.5, 3.10.2, 4.2.7 Architect's Authority to Reject Work 3.5, 4.2.6, 12.1.2, 12.2.1 Architect's Copyright 1.1.7, 1.5 Architect's Decisions 3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3, 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1, 13.5.2, 15.2, 15.3 Architect's Inspections 3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8 3, 9.9.2, 9.10.1, 13.5 Architect's Instructions 3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.5.2 Architect's Interpretations 4.2.11, 4.2.12 Architect's Project Representative 4.2.10 Architect's Relationship with Contractor 1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.2, 4.1.3, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.4.2, 13.5, 15.2Architect's Relationship with Subcontractors 1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3.7 Architect's Representations 9.4.2, 9.5.1, 9.10.1 Architect's Site Visits 3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5 Asbestos 10.3.1 Attorneys' Fees 3.18.1, 9.10.2, 10.3.3 Award of Separate Contracts 6.1.1, 6.1.2 Award of Subcontracts and Other Contracts for **Portions of the Work** 5.2 **Basic Definitions** 1.1 **Bidding Requirements** 1.1.1. 5.2.1. 11.4.1 **Binding Dispute Resolution** 9.7, 11.3.9, 11.3.10, 13.1.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.4.1 **Boiler and Machinery Insurance** 11.3.2 Bonds, Lien 7.3.7.4, 9.10.2, 9.10.3 **Bonds, Performance, and Payment** 7.3.7.4, 9.6.7, 9.10.3, 11.3.9, 11.4 **Building Permit** 3.7.1 Capitalization 1.3

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. User Notes: (1329813346)

Certificate of Substantial Completion 9.8.3, 9.8.4, 9.8.5 **Certificates for Payment** 4.2.1, 4.2.5, 4.2.9, 9.3.3, 9.4, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.3 Certificates of Inspection, Testing or Approval 13.5.4 Certificates of Insurance 9.10.2, 11.1.3 **Change Orders** 1.1.1, 2.4.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11.1, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, 7.2, 7.3.2, 7.3.6, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.3.1.2, 11.3.4, 11.3.9, 12.1.2, 15.1.3 Change Orders, Definition of 7.2.1 CHANGES IN THE WORK 2.2.1, 3.11, 4.2.8, 7, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1, 11.3.9 Claims. Definition of 15.1.1 CLAIMS AND DISPUTES 3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, 15, 15.4 Claims and Timely Assertion of Claims 15.4.1 **Claims for Additional Cost** 3.2.4, 3.7.4, 6.1.1, 7.3.9, 10.3.2, 15.1.4 **Claims for Additional Time** 3.2.4, 3.7.46.1.1, 8.3.2, 10.3.2, 15.1.5 Concealed or Unknown Conditions, Claims for 3.7.4 Claims for Damages 3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1, 11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6 Claims Subject to Arbitration 15.3.1, 15.4.1 **Cleaning Up** 3.15, 6.3 Commencement of the Work, Conditions Relating to 2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.3.1, 11.3.6, 11.4.1, 15.1.4 Commencement of the Work. Definition of 8.1.2 **Communications Facilitating Contract** Administration 3.9.1, 4.2.4 Completion, Conditions Relating to 3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 13.7, 14.1.2 **COMPLETION, PAYMENTS AND** Completion, Substantial 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 13.7

Compliance with Laws 1.6.1, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 10.2.2, 11.1, 11.3, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3 Concealed or Unknown Conditions 3.7.4.4.2.8.8.3.1.10.3 Conditions of the Contract 1.1.1, 6.1.1, 6.1.4 Consent, Written 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 11.3.1, 13.2, 13.4.2, 15.4.4.2 **Consolidation or Joinder** 15.4.4 **CONSTRUCTION BY OWNER OR BY** SEPARATE CONTRACTORS 1.1.4.6 Construction Change Directive, Definition of 7.3.1 **Construction Change Directives** 1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, 7.3, 9.3.1.1 Construction Schedules, Contractor's 3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2 **Contingent Assignment of Subcontracts** 5.4, 14.2.2.2 **Continuing Contract Performance** 15.1.3 Contract, Definition of 1.1.2 CONTRACT. TERMINATION OR SUSPENSION OF THE 5.4.1.1, 11.3.9, 14 **Contract Administration** 3.1.3.4.9.4.9.5 Contract Award and Execution, Conditions Relating to 3.7.1, 3.10, 5.2, 6.1, 11.1.3, 11.3.6, 11.4.1 Contract Documents, Copies Furnished and Use of 1.5.2, 2.2.5, 5.3 Contract Documents, Definition of 1.1.1 **Contract Sum** 3.7.4, 3.8, 5.2.3, 7.2, 7.3, 7.4, 9.1, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.3.1, 14.2.4, 14.3.2, 15.1.4, 15.2.5 Contract Sum, Definition of 9.1 Contract Time 3.7.4, 3.7.5, 3.10.2, 5.2.3, 7.2.1.3, 7.3.1, 7.3.5, 7.4, 8.1.1, 8.2.1, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 14.3.2, 15.1.5.1. 15.2.5 Contract Time, Definition of 8.1.1 **CONTRACTOR** 3 Contractor, Definition of 3.1.6.1.2

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346) User Notes:

Contractor's Construction Schedules 3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2 Contractor's Employees 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1 **Contractor's Liability Insurance** 11.1 Contractor's Relationship with Separate Contractors and Owner's Forces 3.12.5, 3.14.2, 4.2.4, 6, 11.3.7, 12.1.2, 12.2.4 Contractor's Relationship with Subcontractors 1.2.2, 3.3.2, 3.18.1, 3.18.2, 5, 9.6.2, 9.6.7, 9.10.2, 11.3.1.2, 11.3.7, 11.3.8 Contractor's Relationship with the Architect 1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.3, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.5, 15.1.2, 15.2.1 Contractor's Representations 3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2 Contractor's Responsibility for Those Performing the Work 3.3.2, 3.18, 5.3.1, 6.1.3, 6.2, 9.5.1, 10.2.8 Contractor's Review of Contract Documents 3.2 Contractor's Right to Stop the Work 9.7 Contractor's Right to Terminate the Contract 14.1, 15.1.6 Contractor's Submittals 3.10, 3.11, 3.12.4, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3, 11.1.3, 11.4.2 Contractor's Superintendent 3.9. 10.2.6 Contractor's Supervision and Construction Procedures 1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.5, 7.3.7, 8.2, 10, 12, 14, 15.1.3 Contractual Liability Insurance 11.1.1.8, 11.2 Coordination and Correlation 1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1 Copies Furnished of Drawings and Specifications 1.5, 2.2.5, 3.11 Copyrights 1.5, 3.17 Correction of Work 2.3, 2.4, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, 12.2 **Correlation and Intent of the Contract Documents** 1.2 Cost, Definition of 7.3.7 Costs 2.4.1, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.7, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.3, 12.1.2, 12.2.1, 12.2.4, 13.5, 14 **Cutting and Patching** 3.14, 6.2.5

Damage to Construction of Owner or Separate Contractors 3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 11.1.1, 11.3, 12.2.4 Damage to the Work 3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4.1, 11.3.1, 12.2.4 Damages. Claims for 3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1, 11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6 Damages for Delay 6.1.1, 8.3.3, 9.5.1.6, 9.7, 10.3.2 Date of Commencement of the Work, Definition of 8.1.2 Date of Substantial Completion, Definition of 8.1.3 Day. Definition of 8.1.4 Decisions of the Architect 3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 15.2, 6.3, 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.5.2, 14.2.2, 14.2.4, 15.1, 15.2 **Decisions to Withhold Certification** 9.4.1, 9.5, 9.7, 14.1.1.3 Defective or Nonconforming Work, Acceptance, Rejection and Correction of 2.3.1, 2.4.1, 3.5, 4.2.6, 6.2.5, 9.5.1, 9.5.2, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1 Definitions 1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 15.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1 Delays and Extensions of Time 3.2, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, 8.3, 9.5.1, 9.7, 10.3.2, 10.4.1, 14.3.2, 15.1.5, 15.2.5 Disputes 6.3, 7.3.9, 15.1, 15.2 **Documents and Samples at the Site** 3.11 Drawings, Definition of 1.1.5 Drawings and Specifications, Use and Ownership of 3.11 Effective Date of Insurance 8.2.2. 11.1.2 Emergencies 10.4. 14.1.1.2. 15.1.4 Employees, Contractor's 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1 Equipment, Labor, Materials or 1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13.1, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2 Execution and Progress of the Work 1.1.3, 1.2.1, 1.2.2, 2.2.3, 2.2 5, 3.1, 3.3.1, 3.4.1, 3.5, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.5, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.2, 14.2, 14.3.1, 15.1.3

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346) User Notes:

Δ

Extensions of Time 3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2, 10.4.1. 14.3. 15.1.5. 15.2.5 **Failure of Payment** 9.5.1.3, 9.7, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2 Faulty Work (See Defective or Nonconforming Work) **Final Completion and Final Payment** 4.2.1, 4.2.9, 9.8.2, 9.10, 11.1.2, 11.1.3, 11.3.1, 11.3.5, 12.3.1, 14.2.4, 14.4.3 Financial Arrangements, Owner's 2.2.1, 13.2.2, 14.1.1.4 Fire and Extended Coverage Insurance 11.3.1.1 GENERAL PROVISIONS 1 **Governing Law** 13.1 Guarantees (See Warranty) **Hazardous Materials** 10.2.4. 10.3 Identification of Subcontractors and Suppliers 5.2.1Indemnification 3.17, 3.18, 9.10.2, 10.3.3, 10.3.5, 10.3.6, 11.3.1.2, 11.3.7 Information and Services Required of the Owner 2.1.2, 2.2, 3.2.2, 3.12.4, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.4, 13.5.1, 13.5.2, 14.1.1.4, 14.1.4, 15.1.3 **Initial Decision** 15.2 Initial Decision Maker, Definition of 1.1.8 Initial Decision Maker, Decisions 14.2.2, 14.2.4, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5 Initial Decision Maker, Extent of Authority 14.2.2, 14.2.4, 15.1.3, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5 Injury or Damage to Person or Property 10.2.8, 10.4.1 Inspections 3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 12.2.1, 13.5 Instructions to Bidders 111 Instructions to the Contractor 3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.5.2 Instruments of Service, Definition of 1.1.7 Insurance 3.18.1, 6.1.1, 7.3.7, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 11 **Insurance, Boiler and Machinery** 11.3.2 **Insurance, Contractor's Liability** 11.1 Insurance, Effective Date of 8.2.2, 11.1.2

Insurance, Loss of Use 11.3.3 **Insurance, Owner's Liability** 11.2 **Insurance**, **Property** 10.2.5, 11.3 Insurance, Stored Materials 9.3.2 **INSURANCE AND BONDS** 11 Insurance Companies, Consent to Partial Occupancy 9.9.1 Intent of the Contract Documents 1.2.1, 4.2.7, 4.2.12, 4.2.13, 7.4 Interest 13.6 Interpretation 1.2.3, 1.4, 4.1.1, 5.1, 6.1.2, 15.1.1 Interpretations, Written 4.2.11, 4.2.12, 15.1.4 Judgment on Final Award 15.4.2 Labor and Materials, Equipment 1.1.3, 1.1.6, **3.4**, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2 Labor Disputes 8.3.1 Laws and Regulations 1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13.1, 4.1.1, 9.6.4, 9.9.1, 10.2.2, 11.1.1, 11.3, 13.1.1, 13.4, 13.5.1, 13.5.2, 13.6.1, 14, 15.2.8, 15.4 Liens 2.1.2, 9.3.3, 9.10.2, 9.10.4, 15.2.8 Limitations, Statutes of 12.2.5, 13.7, 15.4.1.1 Limitations of Liability 2.3.1, 3.2.2, 3.5, 3.12.10, 3.17, 3.18.1, 4.2.6, 4.2.7. 4.2.12, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 10.2.5, 10.3.3, 11.1.2, 11.2, 11.3.7, 12.2.5, 13.4.2 Limitations of Time 2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7, 5.2, 5.3.1, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3, 11.3.1.5, 11.3.6, 11.3.10, 12.2, 13.5, 13.7, 14, 15 Loss of Use Insurance 11.3.3 Material Suppliers 1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.6, 9.10.5 Materials, Hazardous 10.2.4, 10.3 Materials, Labor, Equipment and 1.1.3, 1.1.6, 1.5.1, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13.1, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1 2, 10.2.4, 14.2.1.1, 14.2.1.2

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346) User Notes:

Means, Methods, Techniques, Sequences and Procedures of Construction 3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2 Mechanic's Lien 2.1.2. 15.2.8 Mediation 8.3.1, 10.3.5, 10.3.6, 15.2.1, 15.2.5, 15.2.6, 15.3, 15.4.1 **Minor Changes in the Work** 1.1.1, 3.12.8, 4.2.8, 7.1, 7.4 **MISCELLANEOUS PROVISIONS** 13 Modifications, Definition of 1.1.1 Modifications to the Contract 1.1.1, 1.1.2, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7, 10.3.2.11.3.1 **Mutual Responsibility** 6.2 Nonconforming Work, Acceptance of 9.6.6, 9.9.3, 12.3 Nonconforming Work, Rejection and Correction of 2.3.1, 2.4.1, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4, 12.2.1 Notice 2.2.1, 2.3.1, 2.4.1, 3.2.4, 3.3.1, 3.7.2, 3.12.9, 5.2.1, 9.7, 9.10, 10.2.2, 11.1.3, 12.2.2.1, 13.3, 13.5.1, 13.5.2, 14.1, 14.2, 15.2.8, 15.4.1 Notice, Written 2.3.1, 2.4.1, 3.3.1, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 9.7, 9.10, 10.2.2, 10.3, 11.1.3, 11.3.6, 12.2.2.1, 13.3, 14, 15.2.8, 15.4.1 Notice of Claims 3.7.4, 10.2.8, 15.1.2, 15.4 Notice of Testing and Inspections 13.5.1, 13.5.2 Observations, Contractor's 3.2, 3.7.4 Occupancy 2.2.2, 9.6.6, 9.8, 11.3.1.5 Orders, Written 1.1.1, 2.3, 3.9.2, 7, 8.2.2, 11.3.9, 12.1, 12.2.2.1, 13.5.2. 14.3.1 **OWNER** 2 Owner, Definition of 2.1.1 **Owner, Information and Services Required of the** 2.1.2, 2.2, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.3, 13.5.1, 13.5.2, 14.1.1.4, 14.1.4, 15.1.3 Owner's Authority 1.5, 2.1.1, 2.3.1, 2.4.1, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 4.1.3, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.1.3, 11.3.3, 11.3.10, 12.2.2, 12.3.1, 13.2.2, 14.3, 14.4, 15.2.7

Owner's Financial Capability 2.2.1, 13.2.2, 14.1.1.4 **Owner's Liability Insurance** 11.2 Owner's Relationship with Subcontractors 1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2 **Owner's Right to Carry Out the Work** 2.4. 14.2.2 **Owner's Right to Clean Up** 6.3 **Owner's Right to Perform Construction and to Award Separate Contracts** 6.1 **Owner's Right to Stop the Work** 2.3 Owner's Right to Suspend the Work 14.3Owner's Right to Terminate the Contract 14.2 **Ownership and Use of Drawings, Specifications** and Other Instruments of Service 1.1.1, 1.1.6, 1.1.7, **1.5**, 2.2.5, 3.2.2, 3.11.1, 3.17, 4.2.12, 5.3.1 Partial Occupancy or Use 9.6.6, 9.9, 11.3.1.5 Patching, Cutting and 3.14, 6.2.5 Patents 3.17 Payment, Applications for 4.2.5, 7.3.9, 9.2, 9.3, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1, 14.2.3, 14.2.4, 14.4.3 **Payment, Certificates for** 4.2.5, 4.2.9, 9.3.3, 9.4, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 13.7, 14.1.1.3, 14.2.4 Payment, Failure of 9.5.1.3, 9.7, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2 Payment, Final 4.2.1, 4.2.9, 9.8.2, 9.10, 11.1.2, 11.1.3, 11.4.1, 12.3.1, 13.7, 14.2.4, 14.4.3 Payment Bond, Performance Bond and 7.3.7.4, 9.6.7, 9.10.3, 11.4 **Payments, Progress** 9.3, 9.6, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3 PAYMENTS AND COMPLETION 9 Payments to Subcontractors 5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2 PCB 10.3.1 **Performance Bond and Payment Bond** 7.3.7.4, 9.6.7, 9.10.3, 11.4 Permits, Fees, Notices and Compliance with Laws 2.2.2, 3.7, 3.13, 7.3.7.4, 10.2.2 PERSONS AND PROPERTY, PROTECTION OF 10

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346) User Notes:

Polychlorinated Biphenyl 10.3.1 Product Data. Definition of 3.12.2 **Product Data and Samples, Shop Drawings** 3.11, 3.12, 4.2.7 **Progress and Completion** 4.2.2, 8.2, 9.8, 9.9.1, 14.1.4, 15.1.3 **Progress Payments** 9.3, 9.6, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3 Project, Definition of 1.1.4 **Project Representatives** 4.2.10 **Property Insurance** 10.2.5. 11.3 PROTECTION OF PERSONS AND PROPERTY 10 **Regulations and Laws** 1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 9.9.1, 10.2.2, 11.1, 11.4, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14, 15.2.8, 15.4 Rejection of Work 3.5, 4.2.6, 12.2.1 Releases and Waivers of Liens 9.10.2 Representations 3.2.1, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.8.2, 9.10.1 Representatives 2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.1, 4.2.2, 4.2.10, 5.1.1, 5.1.2, 13.2.1 Responsibility for Those Performing the Work 3.3.2, 3.18, 4.2.3, 5.3.1, 6.1.3, 6.2, 6.3, 9.5.1, 10 Retainage 9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3 **Review of Contract Documents and Field Conditions by Contractor** 3.2, 3.12.7, 6.1.3 Review of Contractor's Submittals by Owner and Architect 3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2 Review of Shop Drawings, Product Data and Samples by Contractor 3.12 **Rights and Remedies** 1.1.2, 2.3, 2.4, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.2, 12.2.4, 13.4, 14, 15.4 **Royalties, Patents and Copyrights** 3.17 Rules and Notices for Arbitration 15.4.1 Safety of Persons and Property 10.2, 10.4 **Safety Precautions and Programs** 3.3.1, 4.2.2, 4.2.7, 5.3.1, 10.1, 10.2, 10.4

3.12.3 Samples, Shop Drawings, Product Data and 3.11, **3.12**, 4.2.7 Samples at the Site, Documents and 3.11 Schedule of Values 9.2, 9.3.1 Schedules, Construction 3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2 Separate Contracts and Contractors 1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2 Shop Drawings, Definition of 3.12.1 Shop Drawings, Product Data and Samples 3.11, 3.12, 4.2.7 Site. Use of 3.13, 6.1.1, 6.2.1 Site Inspections 3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.4.2, 9.10.1, 13.5 Site Visits, Architect's 3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5, 1, 9.9.2, 9.10, 1, 13.5 Special Inspections and Testing 4.2.6, 12.2.1, 13.5 Specifications, Definition of 1.1.6 **Specifications** 1.1.1, 1.1.6, 1.2.2, 1.5, 3.11, 3.12.10, 3.17, 4.2.14 Statute of Limitations 13.7, 15.4.1.1 Stopping the Work 2.3, 9.7, 10.3, 14.1 Stored Materials 6.2.1. 9.3.2. 10.2.1.2. 10.2.4 Subcontractor, Definition of 5.1.1 **SUBCONTRACTORS** 5 Subcontractors, Work by 1.2.2, 3.3.2, 3.12.1, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7 **Subcontractual Relations** 5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1 Submittals 3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.7, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3, 11.1.3 Submittal Schedule 3.10.2, 3.12.5, 4.2.7 Subrogation, Waivers of 6.1.1, 11.3.7 **Substantial Completion** 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3, 12.2, 13.7 Substantial Completion, Definition of 9.8.1 Substitution of Subcontractors 5.2.3, 5.2.4 7

Samples, Definition of

AIA Document A201TM - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346) User Notes:

Substitution of Architect 4.1.3 Substitutions of Materials 3.4.2. 3.5. 7.3.8 Sub-subcontractor. Definition of 5.1.2 Subsurface Conditions 3.7.4 Successors and Assigns 13.2 Superintendent 3.9, 10.2.6 **Supervision and Construction Procedures** 1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.7, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.3 Suretv 5.4.1.2, 9.8.5, 9.10.2, 9.10.3, 14.2.2, 15.2.7 Surety, Consent of 9.10.2. 9.10.3 Surveys 2.2.3 Suspension by the Owner for Convenience 14.3 Suspension of the Work 5.4.2, 14.3 Suspension or Termination of the Contract 5.4.1.1, 14 Taxes 3.6, 3.8.2.1, 7.3.7.4 **Termination by the Contractor** 14.1. 15.1.6 Termination by the Owner for Cause 5.4.1.1, 14.2, 15.1.6 Termination by the Owner for Convenience 14.4 Termination of the Architect 4.1.3 Termination of the Contractor 14.2.2 TERMINATION OR SUSPENSION OF THE CONTRACT 14 **Tests and Inspections** 3.1.3, 3.3.3, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 11.4.1.1, 12.2.1, 13.5 TIME 8 Time, Delays and Extensions of 3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7, 10.3.2, 10.4.1, 14.3.2, 15.1.5, 15.2.5 Time Limits 2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3, 12.2, 13.5, 13.7, 14, 15.1.2, 15.4


ARTICLE 1 GENERAL PROVISIONS § 1.1 BASIC DEFINITIONS § 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding requirements.

§ 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

§ 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 INSTRUMENTS OF SERVICE

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

AIA Document A201^M - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346)

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 CAPITALIZATION

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 INTERPRETATION

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346)

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

AIA Document A201^M - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. User Notes: (1329813346) **§ 3.2.2** Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instruction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

AIA Document A201TM - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346)

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct,

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346)

but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and .1 all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent. which shall not unreasonably be withheld or delayed.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

AIA Document A201²⁸ - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346) User Notes:

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled

AIA Document A201²⁸ - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346) User Notes:

to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce

AIA Document A201TM - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All right reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346) User Notes:

other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346)

Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittal shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS § 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

AIA Document A201TM - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346)

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents. Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346)

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS § 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations. related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

AIA Document A201TM - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. User Notes: (1329813346) § 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

- .1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
- .2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
- .5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 PROGRESS AND COMPLETION

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346)

furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the

AIA Document A201TM - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346) User Notes:

Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous onsite inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum,
- .5 damage to the Owner or a separate contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. User Notes: (1329813346) **§ 9.6.2** The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 FAILURE OF PAYMENT

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 SUBSTANTIAL COMPLETION

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346)

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

AIA Document A201²⁸ - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346) User Notes:

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled,
- .2 failure of the Work to comply with the requirements of the Contract Documents; or
- .3 terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY § 10.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. User Notes: (1329813346)

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 HAZARDOUS MATERIALS

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346)

§ 10.4 EMERGENCIES

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- .2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 Claims for damages insured by usual personal injury liability coverage;
- .5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- .7 Claims for bodily injury or property damage arising out of completed operations; and
- .8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's negligent

§ 11.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346)

risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Subsubcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. User Notes: (1329813346)

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, subsubcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, subsubcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK § 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346)

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

AIA Document A201²⁸ - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346) User Notes:

ARTICLE 13 MISCELLANEOUS PROVISIONS § 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All right reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346) User Notes:

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT § 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

AIA Document A201^M - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. User Notes: (1329813346)

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

ARTICLE 15 CLAIMS AND DISPUTES § 15.1 CLAIMS § 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346)

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

AIA Document A201TM - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346)

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 ARBITRATION

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The

AIA Document A201[™] - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346)

party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 CONSOLIDATION OR JOINDER

§ 15.4.4.1 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.



AIA Document A201TM - 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 14:24:10 on 08/12/2013 under Order No.7180345737_1 which expires on 04/08/2014, and is not for resale. (1329813346)



GEOTECHNICAL ENGINEERING STUDY

FOR

PROPOSED CITY OF EDINBURG PARK IMPROVEMENTS EDINBURG MUNICIPAL AND DR. DIAZ PARKS EDINBURG, HIDALGO COUNTY, TEXAS



900 East Hackborr

800 East Hackberry McAllen, TX 78501 www.rkci.com

P 956.682.5332 F 956.682.5487 Toll Free 800.316.4912 TBPE Firm F-3257

Project No. AMA19-012-00 April 9, 2019

Mr. Mardoqueo Hinojosa, P.E., CFM, CPM City Engineer City of Edinburg 415 W. University Drive Edinburg, Texas 78541

RE: Geotechnical Engineering Study Proposed City of Edinburg Park Improvements Edinburg Municipal and Dr. Diaz Parks Edinburg, Hidalgo County, Texas

Dear Mr. Hinojosa:

RABA KISTNER Consultants, Inc. (RKCI) is pleased to submit the report of our Geotechnical Engineering Study for the above-referenced project. This study was performed in accordance with **RKCI** Proposal No. PMA19-023-00, dated March 12, 2019. Written authorization to proceed with this study was received by our office on Friday, March 22, 2019 by means of the *Job Task Order Number One (1) to the Agreement Between the City of Edinburg (CLIENT) and RKCI, dated March 21, 2019. The purpose of this study was to drill borings within the subject sites, to perform laboratory testing on selected samples to classify and characterize subsurface conditions, and to prepare an engineering report presenting foundation design and construction recommendations for the proposed building additions.*

The following report contains our foundation recommendations and considerations based on our current understanding of the design tolerances, and structural loads. If any of these parameters change, then there may be alternatives for value engineering of the foundation system, and **RKCI** recommends that a meeting be held with City of Edinburg and the design team to evaluate these alternatives.

O:\Active Projects\McAllen\2019\AMA19\012-00 Prop. City of Edinburg Park Improvements\Reporting\AMA19-012-00.doc

Project No. AMA19-012-00 April 9, 2019

We appreciate the opportunity to be of professional service to you on this project. Should you have any questions about the information presented in this report, please call. We look forward to assisting the City of Edinburg during the construction of the project by conducting the construction materials engineering and testing services (quality assurance program).

Very truly yours,

RABA KISTNER CONSULTANTS, INC.

Saul Cruz, EIT Graduate Engineer

Attachments

SC/KML

Copies Submitted: Above (1)

Katrin M. Leonard, P.E Associate 2019

GEOTECHNICAL ENGINEERING STUDY

For

PROPOSED CITY OF EDINBURG PARK IMPROVEMENTS EDINBURG MUNICIPAL AND DR. DIAZ PARKS EDINBURG, HIDALGO, TEXAS

Prepared for

CITY OF EDINBURG Edinburg, Texas

Prepared by

RABA KISTNER CONSULTANTS, INC. McAllen, Texas

PROJECT NO. AMA19-012-00

April 9, 2019

TABLE OF CONTENTS

INTRODUCTION	
PROJECT DESCRIPTION	1
LIMITATIONS	1
BORINGS AND LABORATORY TESTS	2
GENERAL SITE CONDITIONS	
SITE DESCRIPTION	3
SITE GEOLOGY	3
SEISMIC COEFFICIENTS	4
STRATIGRAPHY	5
GROUNDWATER	6
FOUNDATION ANALYSIS	7
EXPANSIVE, SOIL-RELATED MOVEMENTS	7
PVR REDUCTION RECOMMEDATIONS	7
FOUNDATION RECOMMENDATIONS	9
SITE GRADING	9
SHALLOW FOUNDATIONS Allowable Soil-Bearing Capacity Wire Reinforcement Institute (WRI) Criteria	9 9
AREA FLATWORK	
	11
FOUNDATION CONSTRUCTION CONSIDERATIONS	
FOUNDATION CONSTRUCTION CONSIDERATIONS	
FOUNDATION CONSTRUCTION CONSIDERATIONS SITE DRAINAGE SITE PREPARATION	
FOUNDATION CONSTRUCTION CONSIDERATIONS SITE DRAINAGE SITE PREPARATION SELECT FILL	
FOUNDATION CONSTRUCTION CONSIDERATIONS SITE DRAINAGE SITE PREPARATION SELECT FILL SHALLOW FOUNDATION EXCAVATIONS	
FOUNDATION CONSTRUCTION CONSIDERATIONS SITE DRAINAGE SITE PREPARATION SELECT FILL SHALLOW FOUNDATION EXCAVATIONS EXCAVATION SLOPING AND BENCHING	
FOUNDATION CONSTRUCTION CONSIDERATIONS SITE DRAINAGE SITE PREPARATION SELECT FILL SHALLOW FOUNDATION EXCAVATIONS EXCAVATION SLOPING AND BENCHING EXCAVATION EQUIPMENT	

i

TABLE OF CONTENTS

 CONSTRUCTION RELATED SERVICES
 CONSTRUCTION MATERIALS ENGINEERING AND TESTING SERVICES
 BUDGETING FOR CONSTRUCTION TESTING

ATTACHMENTS

Boring Location Maps
Logs of Borings
Key to Terms and Symbols
Results of Soil Sample Analyses
Important Information About Your Geotechnical Engineering Report
INTRODUCTION

RABA KISTNER Consultants, Inc. (RKCI) has completed the authorized subsurface exploration and foundation recommendations for the proposed restroom building additions for the City of Edinburg Municipal and Dr. Diaz parks in Edinburg, Hidalgo County, Texas. This report briefly describes the procedures utilized during this study and presents our findings along with our recommendations for site preparation, and foundation design and construction considerations for the proposed park improvements.

PROJECT DESCRIPTION

We understand that the proposed project consists of the design and construction of a free-standing restroom building addition at each of the following two city parks (for a total of two restroom buildings):

- 1. Edinburg Municipal Park: 714 S. Raul Longoria Road in Edinburg, Hidalgo County, Texas; and
- 2. Edinburg Dr. Diaz Park: 2202 W. Sprague Street in Edinburg, Hidalgo County, Texas.

The proposed building additions are expected to create relatively light to moderate loads to be carried by the foundation systems, which are anticipated to consist of shallow foundations.

For purposes of this geotechnical engineering report, the finished grade elevation (FGE) of the proposed building additions was assumed to be 12 inches above the ground surface elevation existing at the time of our study, since no site grading information was provided to us at the time of the preparation of this report.

LIMITATIONS

This engineering report has been prepared in accordance with accepted Geotechnical Engineering practices in the region of South Texas for the use of City of Edinburg (CLIENT) and his representatives for design purposes. This report may not contain sufficient information for purposes of other parties or other uses and is not intended for use in determining construction means and methods.

The recommendations submitted in this report are based on the data obtained from four borings drilled at the subject sites, our understanding of the project information provided to us by the CLIENT, and the assumption that site grading will result in only minor changes in the topography existing at the time of our study. If the project information described in this report is incorrect, is altered, or if new information is available, we should be retained to review and modify our recommendations.

This report may not reflect the actual variations of the subsurface conditions across the subject sites. The nature and extent of variations across the subject sites may not become evident until construction commences. The construction process itself may also alter subsurface conditions. If variations appear evident at the time of construction, it may be necessary to reevaluate our recommendations after performing on-site observations and tests to establish the engineering impact of the variations.

RABAKISTNER

The scope of our Geotechnical Engineering Study does not include an environmental assessment of the air, soil, rock, or water conditions either on or adjacent to the sites. No environmental opinions are presented in this report. **RKCI**'s scope of work does not include the investigation, detection, or design related to the prevention of any biological pollutants. The term "biological pollutants" includes, but is not limited to, mold, fungi, spores, bacteria, and viruses, and the byproduct of any such biological organisms.

If final grade elevations are significantly different from the grades assumed in this report, our office should be informed about these changes. If needed and/or desired, we will reexamine our analyses and make supplemental recommendations.

BORINGS AND LABORATORY TESTS

Subsurface conditions at the subject sites were evaluated by conducting four borings as shown in the following table:

Subject Site	Number	Depth, ft*	Boring Identification
Edinburg Municipal Park	2	25	B-1 and B-2
Edinburg Dr. Diaz Park	2	25	B-3 and B-4

* below the existing ground surface elevation, or auger refusal, whichever occurs first.

The borings (designated as "B-") were drilled on March 25, 2019, at the locations shown on the Boring Location Maps, Figure 1. The boring locations are approximate and were located in the field by an **RKCI** representative based on the aerial maps provided to us by the CLIENT via electronic-mail attachment on Thursday, March 7, 2019. The borings were conducted utilizing straight flight augers and were backfilled with the auger cuttings following completion of the drilling operations. During the drilling activities, the following Split-Spoon (with Standard Penetration Test, SPT) and Shelby-tube (ST) samples were collected.

The SPT and ST samples were obtained in accordance with accepted standard practices and the penetration test results are presented as "blows per foot" on the boring logs. Representative portions of the samples were sealed in containers to reduce moisture loss, labeled, packaged, and transported to our laboratory for subsequent testing and classification.

In the laboratory, each sample was evaluated and visually classified by a member of our Geotechnical Engineering staff in general accordance with the Unified Soil Classification System (USCS). The geotechnical engineering properties of the strata were evaluated by the following laboratory tests: natural moisture content, Atterberg limits, and percent passing a No. 200 sieve determinations.

The results of the field and laboratory tests are presented in graphical or numerical form on the boring logs illustrated on Figures 2 through 5. A key to the classification of terms and symbols used on the logs

RABAKISTNER

is presented on Figure 6. The results of the laboratory and field testing are also tabulated on Figure 7 for ease of reference.

SPT results are noted as "blows per ft" on the boring logs and on Figure 7, where "blows per ft" refers to the number of blows by a falling 140-lb (pound) hammer required for 1 ft of penetration into the subsurface materials.

Samples will be retained in our laboratory for 30 days after submittal of this report. Other arrangements may be provided at the written request of the CLIENT.

GENERAL SITE CONDITIONS

SITE DESCRIPTION

The subject sites for the proposed restroom building additions are the following: Edinburg Municipal Park and Edinburg Dr. Diaz Park, which are located within the City of Edinburg, Hidalgo County, Texas.

Edinburg Municipal Park (Borings B-1 and B-2)

At the time of our field activities, the study area can be described as an undeveloped tract of land. The topography of the site is relatively flat, with a visually estimated vertical relief of less than 3 ft. Surface drainage is visually estimated to be poor. The study area is bounded to the north by the existing park playgrounds; to the east by an existing asphalt-paved, access road; and to the south and west by an existing pond.

Edinburg Dr. Diaz Park (Borings B-3 and B-4)

At the time of our field activities, the study area can be described as an undeveloped tract of land. The topography of the site is relatively flat, with a visually estimated vertical relief of less than 3 ft. Surface drainage is visually estimated to be poor. The study area is bounded to the north by W. Sprague Street; to the east by an existing park building, followed by an existing asphalt-paved, parking lot; to the south by the existing park playground; and to the west by an undeveloped tract of land.

SITE GEOLOGY

Edinburg Municipal Park (Borings B-1 and B-2)

A cursory review of the Geologic Atlas of Texas (McAllen-Brownsville Sheet, dated 1976), published by the Bureau of Economic Geology at the University of Texas at Austin, indicates that the subject site appears to be located within the Lissie Formation consisting of clays, silts, sands, gravel, and caliche deposits of the Quaternary epoch (Pleistocene period). According to the Soil Survey of Hidalgo County, Texas, published by the United States Department of Agriculture - Soil Conservation Service, in cooperation with the Texas Agricultural Experiment Station, the project site appears to be located within the Hidalgo soil association consisting of deep, moderately

permeable soils that typically have a dark grayish-brown, sandy clay loam surface layer. The corresponding soil symbol appears to be 28, Hidalgo sandy clay loam, 0 to 1 percent slopes.

Edinburg Dr. Diaz Park (Borings B-3 and B-4)

A cursory review of the Geologic Atlas of Texas (McAllen-Brownsville Sheet, dated 1976), published by the Bureau of Economic Geology at the University of Texas at Austin, indicates that the subject site appears to be located within the Lissie Formation consisting of clays, silts, sands, gravel, and caliche deposits of the Quaternary epoch (Pleistocene period). According to the Soil Survey of Hidalgo County, Texas, published by the United States Department of Agriculture - Soil Conservation Service, in cooperation with the Texas Agricultural Experiment Station, the project site appears to be located within the Hidalgo soil association consisting of deep, moderately permeable soils that typically have a dark grayish-brown, sandy clay loam surface layer. The corresponding soil symbol appears to be 28, Hidalgo sandy clay loam, 0 to 1 percent slopes.

SEISMIC COEFFICIENTS

Edinburg Municipal Park (Borings B-1 and B-2)

Based upon a review of Section 1613 *Earthquake Loads* of the 2012 International Building Code (IBC), the following information has been summarized for seismic considerations associated with this site.

- Site Class Definition (Chapter 20 of the American Society of Civil Engineers [ASCE] 7): Class
 D. Based on the soil borings conducted for this investigation, the upper 100 feet of soil may be may be characterized as a stiff soil profile.
- Risk-Targeted Maximum Considered Earthquake Ground Motion Response Accelerations for the Conterminous United Stated of a 0.2-Second, Spectral Response Acceleration (5% of Critical Damping) (Figure 1613.3.1(1)): $S_s = 0.043g$. Note that the value taken from Figure 1613.3.1(1) is based on Site Class B and is adjusted as per 1613.3.3 below.
- Risk-Targeted Maximum Considered Earthquake Ground Motion Response Accelerations for the Conterminous United States of a 1-Second, Spectral Response Acceleration (5% of Critical Damping) (Figure 1613.3.1(2)): $S_1 = 0.015g$. Note that the value taken from Figure 1613.3.1(2) is based on Site Class B and is adjusted as per 1613.3.3 below.
- Value of Site Coefficient (Table 1613.3.3 (1)): from worksheet **F**_a = **1.6**.
- Value of Site Coefficient (Table 1613.3.3 (2)): from worksheet $F_v = 2.4$.

The Maximum Considered Earthquake Spectral Response Accelerations are as follows:

- 0.2 sec., adjusted based on equation 16-37: from worksheet S_{ms} = 0.069g.
- 1 sec., adjusted based on equation 16-38: from worksheet S_{m1} = 0.035g.

The Design Spectral Response Acceleration Parameters are as follows:

• 0.2 sec., based on equation 16-39: from worksheet **S**_{DS} = **0.046g**.

RABAKISTNER

• 1 sec., based on equation 16-40: from worksheet $S_{D1} = 0.023g$.

Edinburg Dr. Diaz Park (Borings B-3 and B-4)

Based upon a review of Section 1613 *Earthquake Loads* of the 2012 IBC, the following information has been summarized for seismic considerations associated with this site.

- Site Class Definition (Chapter 20 of the ASCE 7): **Class D**. Based on the soil borings conducted for this investigation, the upper 100 feet of soil may be may be characterized as a stiff soil profile.
- Risk-Targeted Maximum Considered Earthquake Ground Motion Response Accelerations for the Conterminous United Stated of a 0.2-Second, Spectral Response Acceleration (5% of Critical Damping) (Figure 1613.3.1(1)): $S_s = 0.043g$. Note that the value taken from Figure 1613.3.1(1) is based on Site Class B and is adjusted as per 1613.3.3 below.
- Risk-Targeted Maximum Considered Earthquake Ground Motion Response Accelerations for the Conterminous United States of a 1-Second, Spectral Response Acceleration (5% of Critical Damping) (Figure 1613.3.1(2)): S₁ = 0.015g. Note that the value taken from Figure 1613.3.1(2) is based on Site Class B and is adjusted as per 1613.3.3 below.
- Value of Site Coefficient (Table 1613.3.3 (1)): from worksheet $F_a = 1.6$.
- Value of Site Coefficient (Table 1613.3.3 (2)): from worksheet $F_v = 2.4$.

The Maximum Considered Earthquake Spectral Response Accelerations are as follows:

- 0.2 sec., adjusted based on equation 16-37: from worksheet **S**_{ms} = **0.069g**.
- 1 sec., adjusted based on equation 16-38: from worksheet S_{m1} = 0.035g.

The Design Spectral Response Acceleration Parameters are as follows:

- 0.2 sec., based on equation 16-39: from worksheet S_{DS} = 0.046g.
- 1 sec., based on equation 16-40: from worksheet S_{D1} = 0.023g.

Based on the parameters listed above, Tables 1613.3.5(1) and 1613.3.5(2), and calculations performed using the United States Geological Survey (USGS) website, the Seismic Design Category for both short period and 1 second response accelerations is **A**. As part of the assumptions required to complete the calculations, a Risk Category of **II** was selected.

STRATIGRAPHY

Edinburg Municipal Park (Borings B-1 and B-2)

On the basis of the borings, the subsurface stratigraphy at this site can be described by a single generalized stratum with similar physical and engineering characteristics. This stratum consists of dark brown to brown to light brown, soft to very stiff, sandy lean clay soils and sandy fat clay soils with gypsum and calcareous nodules. This layer was noted in the borings from the ground surface elevation existing at the time of our study, extending down to at least

RABAKISTNER

the termination depth of the borings. Measured moisture contents range from about 18 to 27 percent. This stratum is classified as plastic, with measured plasticity indices ranging from 26 to 35 percent. Percent passing a No. 200 sieve tests demonstrate percent fines ranging from 50 to 66 percent. SPT N-values ranging from 3 blows to 17 blows per foot of penetration were measured for this stratum. These soils are classified as CL soils and/or CH soils in general accordance with the USCS.

Edinburg Dr. Diaz Park (Borings B-3 and B-4)

On the basis of the borings, the subsurface stratigraphy at this site can be described by a single generalized stratum with similar physical and engineering characteristics. This stratum consists of dark brown to brown, firm to very stiff, sandy lean clay soils and sandy fat clay soils with roots, black ferrous stains, and gypsum and calcareous nodules. This layer was noted in the borings from the ground surface elevation existing at the time of our study, extending down to at least the termination depth of the borings. Measured moisture contents range from about 9 to 26 percent. This stratum is classified as plastic to highly plastic, with measured plasticity indices ranging from 20 to 42 percent. Percent passing a No. 200 sieve tests demonstrate percent fines ranging from 51 to 62 percent. SPT N-values ranging from 5 blows to 27 blows per foot of penetration were measured for this stratum. These soils are classified as CL soils and/or CH soils in general accordance with the USCS.

GROUNDWATER

Groundwater was encountered in some of the borings during the drilling operations at the depths tabulated on the following table:

Project Site	Boring Identification	Approximate Groundwater Depth Encountered During the Drilling Operations (ft) *					
Ediphurg Municipal Dark	B-1	14.5					
	B-2	18.0					
	В-3	DRY					
Edinburg Dr. Diaz Park	B-4	DRY					

* below the ground surface elevations existing at the time of our study.

It is possible for groundwater to exist beneath these sites at shallower depths on a transient basis following periods of precipitation. Fluctuations in groundwater levels occur due to variations in rainfall and surface water run-off. The construction process itself may also cause variations in the groundwater level. Based on the findings in the borings and on our experience in this region, we believe that groundwater seepage encountered during site earthwork activities and shallow foundation construction may be controlled using temporary earthen berm and conventional sump-and-pump dewatering methods.

FOUNDATION ANALYSIS

EXPANSIVE, SOIL-RELATED MOVEMENTS

The anticipated ground movements due to swelling of the underlying soils at these sites were estimated for slab-on-grade construction using the empirical procedure, Texas Department of Transportation (TxDOT) Tex-124-E, Method for Determining the Potential Vertical Rise (PVR). The following PVR values were estimated for the stratigraphic conditions encountered in the borings within each site. The PVR value was estimated using a surcharge load of 1 pound per square inch (psi) for the concrete slab and dry moisture conditions within the regional zone of seasonal moisture variation.

Subject Site	Estimated PVR (in.)
Edinburg Municipal Park	1-1/2
Edinburg Dr. Diaz Park	1-1/4

The TxDOT method of estimating expansive soil-related movements is based on empirical correlations utilizing the measured plasticity indices and assuming typical seasonal fluctuations in moisture content. If desired, other methods of estimating expansive soil-related movements are available, such as estimations based on swell tests and/or soil-suction analyses. However, the performance of these tests and the detailed analysis of expansive soil-related movements were beyond the scope of the current study. It should also be noted that actual movements can exceed the calculated PVR values due to isolated changes in moisture content (such as due to leaks, landscape watering...) or if water seeps into the soils to greater depths than the assumed active zone depth due to deep trenching or excavations.

PVR REDUCTION RECOMMEDATIONS

As previously mentioned, for purposes of this geotechnical engineering report, the FGE of the proposed building additions was assumed to be 12 inches above the ground surface elevation existing at the time of our study, since no site grading information was provided to us at the time of the preparation of this report.

Edinburg Municipal Park (Borings B-1 and B-2)

To reduce expansive, soil-related movements in at-grade construction beneath the restroom building addition footprint area to about 1 inch, we recommend the following site improvement procedure be implemented:

- Remove a minimum of about 2 ft (24 inches) of the existing subgrade clay soils and discard them. The excavation shall extend a minimum of 5 ft beyond the building addition's perimeter.
- Proofroll the exposed subgrade as indicated in the *Site Preparation* subsection of the *Foundation Construction Considerations* section of this report.

• Once the proofrolling operations are complete and documented, place suitable, select fill materials into the excavation in uniform 6-inch thick compacted lifts to reach the building addition's FGE. Each lift should be compacted and tested as indicated in the *Select Fill* subsection of the *Foundation Construction Considerations* section of this report.

Edinburg Dr. Diaz Park (Borings B-3 and B-4)

To reduce expansive, soil-related movements in at-grade construction beneath the restroom building addition footprint area to about 1 inch, we recommend the following site improvement procedure be implemented:

- * Remove a minimum of about 1 ft (12 inches) of the existing subgrade clay soils and discard them. The excavation shall extend a minimum of 5 ft beyond the building addition's perimeter.
- * Proofroll the exposed subgrade as indicated in the *Site Preparation* subsection of the *Foundation Construction Considerations* section of this report.
- * Once the proofrolling operations are complete and documented, place suitable, select fill materials into the excavation in uniform 6-inch thick compacted lifts to reach the building addition's FGE. Each lift should be compacted and tested as indicated in the *Select Fill* subsection of the *Foundation Construction Considerations* section of this report.

Keep in mind that the estimated PVR values are computed based on the recommendations for the selection and placement of suitable, select fill materials which are addressed in the *Foundation Construction Considerations* section of the report.

Drainage Considerations When overexcavation and select fill replacement is selected as a method to reduce the potential for expansive, soil-related movements at any site, considerations of surface and subsurface drainage may be crucial to construction and adequate foundation performance of the soil-supported structures. Filling excavations in relatively impervious plastic clays with relatively pervious select fill material creates a "bathtub" beneath the structures, which can result in ponding or trapped water within the fill unless good surface and subsurface drainage is provided.

Water entering the fill surfaces during construction or entering the fill exposed beyond the structure lines after construction may create problems with fill moisture control during compaction and increased access for moisture to the underlying expansive clays both during and after construction.

Several surface and subsurface drainage design features and construction precautions can be used to limit problems associated with fill moisture. These features and precautions may include, but are not limited to, the following:

• Installing berms or swales on the uphill side of the construction area to divert surface runoff away from the excavation/fill areas during construction;

RABAKISTNER

- Sloping of the top of the subgrades with a minimum downward slope of 1.5 percent out to the base of a dewatering trench located beyond the structures' perimeters;
- Sloping the surface of the fill during construction to promote runoff of rain water to drainage features until the final lift is placed;
- Sloping of a final, well-maintained, impervious clay or pavement surface (downward away from the proposed structures) over the select fill material and any perimeter drain extending beyond the structure lines, with a minimum gradient of 6 in. in 5 ft;
- Constructing final surface drainage patterns to prevent ponding and limit surface water infiltration at and around the structures' perimeters;
- Locating the water-bearing utilities, roof drainage outlets, and irrigation spray heads outside of the select fill and perimeter drain boundaries; and
- Raising the elevation of the ground level floor slabs.

Details relative to the extent and implementation of these considerations must be evaluated on a project-specific basis by all members of the project design team. Many variables that influence fill drainage considerations may depend on factors that are not fully developed in the early stages of design. For this reason, drainage of the fill should be given consideration at the earliest possible stages of the project.

FOUNDATION RECOMMENDATIONS

SITE GRADING

Site grading plans can result in changes in almost all aspects of foundation recommendations. We have prepared the foundation recommendations based on the ground surface elevations and the stratigraphic conditions encountered in the borings at the time of our study. If site grading plans differ from the grades existing at the time of our study by more than plus or minus 1 ft, we must be retained to review the site grading plans prior to bidding the project for construction. This will enable us to provide input for any changes in our original recommendations, which may be required as a result of site grading operations or other considerations.

SHALLOW FOUNDATIONS

The proposed building additions may be founded on rigid-engineered beam and slabs-on-fill foundation and/or on a conventional spread and/or continuous footing foundations, provided that the shallow foundation type(s) can be designed to withstand the anticipated soil-related movements (see the *Foundation Analyses* section of this report) without impairing either the structural or the operational performance of the proposed structures.

Allowable Soil-Bearing Capacity

Shallow foundations founded on new, properly-compacted, suitable, select fill materials, following the implementation of the ground improvement procedure presented in the *PVR Reduction Recommendations*

9

RABAKISTNER

subsection of the *Foundation Analysis* section of this report may be proportioned using the design parameters shown in the following table:

24 in.
12 in.
1,000 psf
1,250 psf

Where psf = pounds per square feet

The above maximum allowable soil-bearing pressures will provide a factor of safety of about 3 with respect to the measured soil shear strength, provided that the subgrades are prepared in accordance with the recommendations outlined in the *Site Preparation* subsection of the *Foundation Construction Considerations* section of this report, and the ground improvement procedures are implemented in accordance with the recommendations presented in the *PVR Reduction Recommendations* subsection of the *Foundation Analysis* section of this report. We estimate total settlements to be on the order of about 1 inch. Differential settlements are typically estimated to be about one-half of the total estimated settlement for most subsurface conditions.

Furthermore, the design parameters presented on the previous table are contingent upon the fill materials being selected and placed in accordance with the recommendations presented in the *Select Fill* subsection of the *Foundation Construction Considerations* section of this report. Should select fill selection and placement differ from the recommendations presented herein, **RKCI** should be informed of the deviations in order to reevaluate our recommendations and design criteria.

Wire Reinforcement Institute (WRI) Criteria

Beam and slab foundations are sometimes designed using criteria developed by the WRI. On the basis of the subsurface stratigraphy encountered at the time of our field operations, general effective plasticity indices for each structure are presented on the following table. The design plasticity indices presented below apply to the conditions encountered in the borings and the grades existing at the time of our study. A climatic rating (C_w) of 15 should be utilized for the design of the structures.

Subject Site	Recommended WRI Design PI
Edinburg Municipal Park	30
Edinburg Dr. Diaz Park	31

AREA FLATWORK

It should be noted that ground-supported flatwork such as walkways, driveways, courtyards, sidewalks, etc., will be subject to the same magnitude of potential soil-related movements as discussed previously (see the *Foundation Analyses* section of the report) for these sites. Thus, where these types of elements abut rigid building foundations or isolated structures, differential movements should be anticipated. As a minimum, we recommend that flexible joints be provided where such elements abut the main structure to allow for differential movement at these locations. Where the potential for differential movement is objectionable, it may be beneficial to consider methods of reducing anticipated movements to match the adjacent structures' performance.

FOUNDATION CONSTRUCTION CONSIDERATIONS

SITE DRAINAGE

Drainage is an important key to the successful performance of any foundation. Good surface drainage should be established prior to and maintained after construction to help prevent water from ponding within or adjacent to the proposed structures' foundations and to facilitate rapid drainage away from the structures' foundations. Failure to provide positive drainage away from the structures can result in localized differential vertical movements in soil supported foundation and floor slabs.

Current ordinances, in compliance with the Americans with Disabilities Act (ADA), may dictate maximum slopes for walks and drives around and into new buildings. These slope requirements can result in drainage problems for buildings supported on expansive soils. We recommend that, on all sides of the proposed structures, the maximum permissible slope be provided away from the proposed structures.

Also to help control drainage in the vicinity of the structures, we recommend that roof/gutter downspouts and landscaping irrigation systems not be located adjacent to the structures' foundations. Where a select fill overbuild is provided outside of the floor slab/foundation footprints, the surface should be sealed with an impermeable layer (pavement or clay cap) to reduce infiltration of both irrigation and surface waters. Careful consideration should also be given to the location of water bearing utilities, as well as to provisions for drainage in the event of leaks in water bearing utilities. All leaks should be immediately repaired.

Other drainage and subsurface drainage issues are discussed in the *Foundation Analysis* section of this report.

SITE PREPARATION

The structure areas and all areas to support select fill should be stripped of vegetation, and/or organic topsoil down to a minimum depth of 8 inches and extending a minimum of 5 ft beyond the structures' footprint areas. Further, we recommend that site improvement procedures presented in the *PVR*

RABAKISTNER

Reduction Recommendations section of this report be implemented to reduce the soil-related movements within the proposed structures.

Exposed subgrades should be thoroughly proofrolled in order to locate and densify any weak, compressible zones. A minimum of 5 passes of a fully-loaded dump truck or a similar heavily-loaded piece of construction equipment should be used for planning purposes. Proofrolling operations should be observed by the Geotechnical Engineer or his/her representative to document subgrade conditions and preparation. Weak or soft areas identified during proofrolling should be treated with hydrated lime or Portland cement, or removed and replaced with a suitable, compacted select fill in accordance with the recommendations presented under the *Select Fill* subsection of this section of the report. If the treatment option is selected, the weak or soft areas may be mixed with hydrated lime or Portland cement down to a minimum depth of 8 inches in order to aid in drying the soils and develop a firm working surface. Proofrolling operations and any excavation/backfill activities should be observed by **RKCI** representatives to document subgrade preparation.

Upon completion of the proofrolling operations and just prior to fill placement or slab construction, the exposed subgrade should be moisture conditioned by scarifying to a minimum depth of 6 in. and recompacting to a minimum of 98 percent of the maximum density determined from the American Society for Testing and Materials (ASTM) D698, Compaction Test. The moisture content of the subgrade should be maintained within the range of the optimum moisture content to three percentage points above the optimum moisture content until permanently covered.

SELECT FILL

Materials used as select fill for final site grading preferably should be crushed stone or gravel aggregate. We recommend that materials specified for use as select fill meet the TxDOT 2014 Standard Specification for Construction and Maintenance of Highways, Streets, and Bridges, Item 247, Flexible Base, Type A through Type E, Grades 1, 2, 3, and 5.

Alternatively, the following soils, as classified according to the USCS, may be considered satisfactory for use as select fill materials at these sites: SC, GC, CL, and combinations of these soils. In addition to the USCS classification, alternative select fill materials shall have a maximum liquid limit of 40 percent, a plasticity index between 7 and 18 percent, and a maximum particle size not exceeding 4 inches or one-half the loose lift thickness, whichever is smaller. In addition, if these materials are utilized, grain size analyses and Atterberg Limits must be performed during placement at a minimum rate of one test each per 5,000 cubic yards of material due to the high degree of variability associated with pit-run materials.

Soils classified as CH, MH, ML, SM, GM, OH, OL, and Pt under the USCS and not meeting the alternative select fill material requirements, are <u>not</u> considered suitable for use as select fill materials at these sites. The native soils at these sites are <u>not</u> considered suitable for use as select fill materials.

Select fill should be placed in loose lifts **not** exceeding 8 in. in thickness and compacted to at least 98 percent of the maximum dry density as determined by ASTM D698. The moisture content of the subgrade

should be maintained within the range of two percentage points below the optimum moisture content to two percentage points above the optimum moisture content until permanently covered.

The select fill should be properly compacted in accordance with these recommendations and tested by **RKCI** personnel for compaction as specified.

SHALLOW FOUNDATION EXCAVATIONS

Shallow foundation excavations should be observed by the Geotechnical Engineer or his/her representative prior to placement of reinforcing steel and concrete. This is necessary to document that the bearing soils at the bottom of the excavations are similar to those encountered in the borings and that excessive soft materials and water are not present in the excavations. If soft soil pockets are encountered in the foundation excavations, they should be removed and replaced with a compacted non-expansive fill material or lean concrete up to the design foundation bearing elevations.

Disturbance from foot traffic and from the accumulation of excess water can result in losses in bearing capacity and increased settlement. If inclement weather is anticipated at the time construction, consideration should be given to protecting the bottoms of beam trenches by placing a thin mud mat (layer of flowable fill or lean concrete) at the bottom of trenches immediately following excavation. This will reduce disturbance from foot traffic and will impede the infiltration of surface water. All necessary precautions should be implemented to protect open excavations from the accumulation of surface water runoff and rain.

EXCAVATION SLOPING AND BENCHING

Excavations that extend to or below a depth of 5 ft below construction grade shall require the General Contractor to develop a trench safety plan to protect personnel entering the trench or trench vicinity. The collection of specific geotechnical data and the development of such a plan, which could include designs for sloping and benching or various types of temporary shoring, is beyond the scope of the current study. Any such designs and safety plans shall be developed in accordance with current Occupational Safety and Health Administration (OSHA) guidelines and other applicable industry standards.

EXCAVATION EQUIPMENT

The boring logs are not intended for use in determining construction means and methods and may therefore be misleading if used for that purpose. We recommend that earthwork and utility contractors interested in bidding on the work perform their own tests in the form of test pits determine the quantities of the different materials to be excavated, as well as the preferred excavation methods and equipment for these sites.

UTILITIES

Utilities which project through slab-on-grade, slab-on-fill, "floating" floor slabs, or any other rigid unit should be designed with either some degree of flexibility or with sleeves. Such design features will help reduce the risk of damage to the utility lines as vertical movements occur.

Our experience indicates that significant settlement of backfill can occur in utility trenches, particularly when trenches are deep, when backfill materials are placed in thick lifts with insufficient compaction, and when water can access and infiltrate the trench backfill materials. The potential for water to access the backfill is increased where water can infiltrate flexible base materials due to insufficient penetration of curbs, and at sites where geological features can influence water migration into utility trenches. It is our belief that another factor which can significantly impact settlement is the migration of fines within the backfill into the open voids in the underlying free-draining bedding material.

To reduce the potential for settlement in utility trenches, we recommend that consideration be given to the following:

- All backfill materials should be placed and compacted in controlled lifts appropriate for the type of backfill and the type of compaction equipment being utilized and all backfilling procedures should be tested and documented.
- Consideration should be given to wrapping free-draining bedding gravels with a geotextile fabric (similar to Mirafi 140N) to reduce the infiltration and loss of fines from backfill material into the interstitial voids in bedding materials.

CONSTRUCTION RELATED SERVICES

CONSTRUCTION MATERIALS ENGINEERING AND TESTING SERVICES

As presented in the attachment to this report, *Important Information About Your Geotechnical Engineering Report*, subsurface conditions can vary across a project site. The conditions described in this report are based on interpolations derived from a limited number of data points. Variations will be encountered during construction, and only the geotechnical design engineer will be able to determine if these conditions are different than those assumed for design.

Construction problems resulting from variations or anomalies in subsurface conditions are among the most prevalent on construction projects and often lead to delays, changes, cost overruns, and disputes. These variations and anomalies can best be addressed if the geotechnical engineer of record, **RABA KISTNER Consultants, Inc.**, is retained to perform the construction materials engineering and testing services during the construction of the project. This is because:

• **RKCI** has an intimate understanding of the geotechnical engineering report's findings and recommendations. **RKCI** understands how the report should be interpreted and can provide such interpretations on site, on the CLIENT's behalf.

- **RKCI** knows what subsurface conditions are anticipated at these sites.
- **RKCI** is familiar with the goals of the CLIENT and the project's design professionals, having worked with them in the development of the project geotechnical workscope. This enables **RKCI** to suggest remedial measures (when needed) which help meet others' requirements.
- **RKCI** has a vested interest in client satisfaction, and thus assigns qualified personnel whose principal concern is client satisfaction. This concern is exhibited by the manner in which contractors' work is tested, evaluated and reported, and in selection of alternative approaches when such may become necessary.
- RKCI cannot be held accountable for problems which result due to misinterpretation of our findings or recommendations when we are not on hand to provide the interpretation which is required.

BUDGETING FOR CONSTRUCTION TESTING

Appropriate budgets need to be developed for the required construction materials engineering and testing services. At the appropriate time before construction, we advise that **RKCI** and the project designers meet and jointly develop the testing budgets, as well as review the testing specifications as it pertains to this project.

Once the construction testing budget and scope of work are finalized, we encourage a preconstruction meeting with the selected General Contractor to review the scope of work to make sure it is consistent with the construction means and methods proposed by the contractor. **RKCI** looks forward to the opportunity to provide continued support on this project, and would welcome the opportunity to meet with the Project Team to develop both a scope and budget for these services.

* * * * * * * * * * * * * * * * * *

The following figures are attached and complete this report:

Figure 1	Boring Location Map
Figures 2 through 5	Logs of Borings
Figure 6	Key to Terms and Symbols
Figure 7	Results of Soil Sample Analyses

ATTACHMENTS



EDINBURG MUNICIPAL PARK



DR DI AZ PARK





Engineering • Testing • Environmental Facilities • Infrastructure

800 E. Hackberry Avenue McAllen, Texas 78501 (956)682-5332 TEL (956)682-5487 FAX <u>www.rkci.com</u> TBPE Firm F-3257



DRILL	LOG OF BORING NO. B-1 Prop. City of Edinburg Park Improvements Edinburg Municipal Park and Dr. Diaz Park Edinburg, Hidalgo County, Texas														
METH	IOD:	Stra	aight Flight Auger				LO	CATION:	Se	e Figure	1				
DEPTH, FT	SYMBOL	SAMPLES		IAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	0	SH -O	EAR S	TRENGTI 2.0 2 WATER CONTEN	H, TONS	/FT ² 	4.0	PLASTICITY INDEX	% -200
			SANDY LEAN CLAY (CL) firm to very stiff, dark brown to br with calcareous nodules	own,	5] 	<u>0 20</u>	30	40 5	0 60				50
 - 5					4		-	ו	•	×			-	27	51
			SANDY FAT CLAY (CH) stiff to very stiff, brown, with calca nodules	areous	12		-	*			-×		-	35	
					14		-	•					-		
15 		X			14			•					-		
20 			 with gypsum crystals below a dept about 20 ft 	h of	13		-	•	•				-		
25			Boring terminated at a depth of abc	out 25 ft.			-								
 	-		NOTES: During the drilling operations, groun was encountered at a depth of a 14.5 ft. Upon completion of the o operations, groundwater was me at a depth of about 7 ft.	ndwater bout drilling easured											
DEPTH DATE	i 1 drili Drille	ED:	25.0 ft DEPTH 3/25/2019 DATE	ا TO WATEF MEASURED	R:	14.5 f 3/25/2	ft 2019			PR(FIG	J. No.: URE:	A	MA19-0	112-00)

	LOG OF BORING NO. B-2 Prop. City of Edinburg Park Improvements Edinburg Municipal Park and Dr. Diaz Park Edinburg Hidalgo County Texas									E R 3257					
DRILL	ING IOD:	Str	aight Flight Auger	24115415,11	i dang	,0 00			J: Se	- Figure '	1				
						SHEAR STRENGTH. TONS/FT ²									
DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF M SURFACE ELEVATION: Existing	IATERIAL Grade, ft	BLOWS PER FT	UNIT DRY WEIGHT, pcf	C	0.5 1.0 PLASTIC LIMIT 	 1.5 30	2.0 2 WATER CONTEN 	.5 3.0 .5 3.0 .7 .0 60		0	PLASTICITY INDEX	% -200
			SANDY LEAN CLAY (CL) soft to firm, dark brown		3		_	-					_	26	
 - 5			SANDY FAT CLAY (CH) stiff to very stiff, brown, wit	th calcareous	8		_		•		*			30	66
			nodules				-	•	,	•			-		63
		X			17		-	•					-		
 15 		X			14	2	-	•					-		
 20 		X	 becomes light brown in colo depth of about 20 ft 	or below a	13		-	•					-		
 —25—			Boring terminated at a depth	of about 25 ft.	16		_	•					_		
 			NOTES: During the drilling operations was encountered at a dep ft. Upon completion of the operations, groundwater at a depth of about 16 ft.	s, groundwater th of about 18 e drilling was measured			-						-		
DEPTH DATE	i Drill Drille	ED: D:	25.0 ft 3/25/2019	DEPTH TO WATER DATE MEASURED	 R:):	l 18 ft 3/25/	L 2019			PRO	DJ. No.: URE:	AN 3	1A19-0	12-00)

	LOG OF BORING NO. B-3 Prop. City of Edinburg Park Improvements Edinburg Municipal Park and Dr. Diaz Park Edinburg, Hidalgo County, Texas															
METH	ING IOD:	Stra	aight Flight Auger	-	-		LO	CATIO	N: S	ee Figu	ire 1					
								9	SHEAR	STREN	IGTH,	TONS/	′FT²			
DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF M	IATERIAL	LOWS PER FT	UNIT DRY WEIGHT, pcf	0	.5 1. PLAST LIMI		5 2.0 W	⊗— — 2.5 ATER NTENT	3.0		4.0	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: Existing	Grade, ft	æ	-	1	$0 \xrightarrow{-\times}{2}$	0 30	40	• 50	60	- — X — 70	80		
			SANDY LEAN CLAY (CL) firm, dark brown, with root down to a depth of about 2	s extending ! ft	6		(• ×						-	20	
					5		_	•						-		57
- 5 			SANDY FAT CLAY (CH) very stiff, brown, with calca	reous nodules			_	•			•			-		
					27		-)×			+>	×	-	42	
					17		-							-		62
 15			- with gypsum crystals below	a depth of	23		-		•					-		
							_							-		
		X			23		_		•					-		
 25	Į		Boring terminated at a denth	of about 25 ft	30		_		•					-		
	-		NOTES: Upon completion of the drilli the boring was observed of	ng operations,			-							-		
 30	-						-									
	-						-							-		
DEPTH DATE	 Drill Drille	ED:	25.0 ft 3/25/2019	DEPTH TO WATEF DATE MEASURED	R: :	DRY 3/25/	2019				PROJ. FIGUR	No.: RE:	A	 MA19-(012-00)

	LOG OF BORING NO. B-4 Prop. City of Edinburg Park Improvements Edinburg Municipal Park and Dr. Diaz Park Edinburg, Hidalgo County, Texas															
DRILL METH	ING IOD:	Stra	aight Flight Auger	Luniburg, H	lauig	,0 00	LO		N: 1	See F	igure :	L				
								S	SHEAF	R STR	ENGTI	I, TONS	6/FT ²			
ᄩ	۲.	ES			ER FT	₽cf	_ ۱	- 0 -	 0 1	<>	_⊗ ∩2	⊗∆			È,	
PTH,	MBG	MPL	DESCRIPTION OF N	IATERIAL	NS PI	IT D	0	PLAST		J 2	WATER	.5 5.0		D	ASTIC NDE)	۶ - 20
B	S	S,			BLOV	28			г				т -	2	î	
			SURFACE ELEVATION: Existing	g Grade, ft			1	<u>0 2</u> () 3	04	<u>10 5</u>	<u>0 60</u>	70	80		
		\mathbb{N}	SANDY LEAN CLAY (CL)		10											51
		\square												-		
							-									
								• *		>	* 🖌				21	
							-									
L 5																
		М	SANDY FAT CLAY (CH)	6 h	21											61
		\square	calcareous nodules	i, brown, with			-							-		01
							-							-	-	
		\square			20		_		×						37	
L _		\square			20		_		^						5/	
10																
-10-		\bigtriangledown			10		_									
		\wedge			10		-		•					-		
							-								-	
L _							_									
		1					-							-		
-15-		\mathbb{H}	- with black forrous stains be	how a depth of										-	-	
		X	about 15 ft	now a depth of	17		-		•						-	
		H														
							-									
		1					-							-	-	
-20-		Ц					_								-	
L _		X			21		_	•								
		μ														
		1					-									
			- with gynsum crystals below	a denth of			-							-	-	
		\mathbb{N}	about 23 ft		22		-		•							
-25-		\triangle			~~~				-							
			Boring terminated at a depth	n of about 25 ft.												
	1						_							-		
			NOTES:				-							-		
	 Upon completion of the drilling operations, 				-							-	-			
-					F							.				
20																
F -	1						-								1	
							-							-	1	
							-								4	
L _							_									
DEPTH DRILLED: 25.0 ft DEPTH TO WATER: DRY PROJ. No.: AMA19-01						012-00	5									
DATE DRILLED: 3/25/2019 DATE MEASURED):	3/25/	2019				FIG	URE:		5				



FIGURE 6a

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

Terms used in this report to describe soils with regard to their consistency or conditions are in general accordance with the discussion presented in Article 45 of SOILS MECHANICS IN ENGINEERING PRACTICE, Terzaghi and Peck, John Wiley & Sons, Inc., 1967, using the most reliable information available from the field and laboratory investigations. Terms used for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in American Society for Testing and Materials D2487-06 and D2488-00, Volume 04.08, Soil and Rock; Dimension Stone; Geosynthetics; 2005.

The depths shown on the boring logs are not exact, and have been estimated to the nearest half-foot. Depth measurements may be presented in a manner that implies greater precision in depth measurement, i.e 6.71 meters. The reader should understand and interpret this information only within the stated half-foot tolerance on depth measurements.

RELATIVE DENSITY COHESIVE STRENGTH PLASTICITY Penetration Resistance Relative Resistance Cohesion Plasticity Degree of Blows per ft **Density** Blows per ft **Consistency** Index Plasticity <u>TSF</u> 0 - 2 0 - 0.125 0 - 5 0 - 4 Very Loose Very Soft None 2 - 4 4 - 10 Soft 0.125 - 0.25 5 - 10 Loose Low 10 - 30 Medium Dense 4 - 8 Firm 0.25 - 0.5 10 - 20 Moderate 0.5 - 1.0 20 - 40 Plastic 30 - 50 Dense 8 - 15 Stiff > 50 Very Dense 15 - 30 Very Stiff 1.0 - 2.0 > 40 **Highly Plastic** > 30 Hard > 2.0

ABBREVIATIONS

B = Benzene	Qam, Qas, Qal =	Quaternary Alluvium	Kef = Eagle Ford Shale
T = Toluene	Qat =	Low Terrace Deposits	Kbu = Buda Limestone
E = Ethylbenzene	Qbc =	Beaumont Formation	Kdr = Del Rio Clay
X = Total Xylenes	Qt =	Fluviatile Terrace Deposits	Kft = Fort Terrett Member
BTEX = Total BTEX	Qao =	Seymour Formation	Kgt = Georgetown Formation
TPH = Total Petroleum Hydro	carbons Qle =	Leona Formation	Kep = Person Formation
ND = Not Detected	Q-Tu =	Uvalde Gravel	Kek = Kainer Formation
NA = Not Analyzed	Ewi =	Wilcox Formation	Kes = Escondido Formation
NR = Not Recorded/No Reco	overy Emi =	Midway Group	Kew = Walnut Formation
OVA = Organic Vapor Analyze	r Mc =	Catahoula Formation	Kgr = Glen Rose Formation
ppm = Parts Per Million	EI =	Laredo Formation	Kgru = Upper Glen Rose Formation
	Kknm =	Navarro Group and Marlbrook	Kgrl = Lower Glen Rose Formation
			Kh = Hensell Sand
	Kpg =	Pecan Gap Chalk	
	Kau =	Austin Chalk	

PROJECT NO. AMA19-012-00

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

SOIL STRUCTURE

Slickensided Fissured Pocket Parting Seam Layer Laminated Interlayered Intermixed Calcareous Carbonate	Having planes of weakness that appear slick a Containing shrinkage or relief cracks, often fil Inclusion of material of different texture that Inclusion less than 1/8 inch thick extending th Inclusion 1/8 inch to 3 inches thick extending Inclusion greater than 3 inches thick extendin Soil sample composed of alternating partings Soil sample composed of alternating layers of Soil sample composed of pockets of different Having appreciable quantities of carbonate. Having more than 50% carbonate content.	and glossy. led with fine sand or silt; usually more or less vertical. is smaller than the diameter of the sample. brough the sample. g through the sample. or seams of different soil type. ¹ different soil type. soil type and layered or laminated structure is not evident.								
	SAMPLING METHODS									
	RELATIVELY UNDISTURBED SAMPLING									
Cohesive soil sa for Thin-Walled samplers in gen D1586). Cohes integrity and mo	Cohesive soil samples are to be collected using three-inch thin-walled tubes in general accordance with the Standard Practice for Thin-Walled Tube Sampling of Soils (ASTM D1587) and granular soil samples are to be collected using two-inch split-barrel samplers in general accordance with the Standard Method for Penetration Test and Split-Barrel Sampling of Soils (ASTM D1587). Cohesive soil samples may be extruded on-site when appropriate handling and storage techniques maintain sample integrity and moisture content.									
	STANDARD PENETRATION TEST (SPT)									
A 2-inOD, 1-3/ After the sample Standard Peneti	8-inID split spoon sampler is driven 1.5 ft into un er is seated 6 in. into undisturbed soil, the numbe ration Resistance or "N" value, which is recorded	ndisturbed soil with a 140-pound hammer free falling 30 in. er of blows required to drive the sampler the last 12 in. is the as blows per foot as described below.								
Blows Per Foo	SPLIT-BARREL SAMPLE	R DRIVING RECORD Description								
25 50/7" Ref/3" <u>NOTE:</u>	To avoid damage to sampling tools, driving is limi	25 blows drove sampler 12 inches, after initial 6 inches of seating. 50 blows drove sampler 7 inches, after initial 6 inches of seating. 50 blows drove sampler 3 inches during initial 6-inch seating interval. ted to 50 blows during or after seating interval.								

PROJECT NO. AMA19-012-00

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME:

Prop. City of Edinburg Park Improvements Edinburg Municipal Park and Dr. Diaz Park Edinburg, Hidalgo County, Texas

FILE NAME: AMA19-012-00 GP.I

Boring	Sample					1					1
	Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-1	0.0 to 1.5	5	21						50		
	2.5 to 4.0	4	23	47	20	27	CL				
	5.0 to 7.0		21						51	1.20	PP
	7.5 to 9.0	12	22	54	19	35	СН				
	10.0 to 11.5	14	21								
	15.0 to 16.5	14	21								
	20.0 to 21.5	13	27								
	23.5 to 25.0	16	21								
B-2	0.0 to 1.5	3	18	43	17	26	CL				
	2.5 to 4.0	5	24						66		
	5.0 to 6.5	8	21	51	21	30	СН				
	7.0 to 9.0		21						63	1.90	PP
	10.0 to 11.5	17	20								
	15.0 to 16.5	14	19								
	20.0 to 21.5	13	21								
	23.5 to 25.0	16	21								
B-3	0.0 to 1.5	6	10	37	17	20	CL				
	2.5 to 4.0	5	16						57		
	5.0 to 7.0		18							2.25	PP
	7.5 to 9.0	27	20	65	23	42	СН				
	10.0 to 11.5	17	21						62		
	15.0 to 16.5	23	26								
	20.0 to 21.5	23	22								
	23.5 to 25.0	30	22								
B-4	0.0 to 1.5	10	9						51		
	2.0 to 4.0		11	40	19	21	CL			2.25	PP
	5.0 to 6.5	21	13						61		
	7.5 to 9.0	20	20	58	21	37	СН				
	10.0 to 11.5	10	21								
	15.0 to 16.5	17	22								
	20.0 to 21.5	21	19								
	23.5 to 25.0	22	22								
P = Pock	ket Penetrome	ter TV =	Torvane	UC = Unco	nfined Com	pression	FV = Field	d Vane UU =	Unconsolid	ated Undrai	ned Triaxia
U = Cons	solidated Undr	ained Triaxi	al CNE	3D = Cound			NP = Non	-Plastic Pl	ROJECT N	0. AMA1	9-012-00

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one* — *not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a lightindustrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an

assessment of their impact. *Geotechnical engineers cannot* accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmationdependent recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, but preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/ or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnicalengineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the express purpose of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.



8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

Copyright 2015 by Geoprofessional Business Association (GBA). Duplication, reproduction, or copying of this document, or its contents, in whole or in part, by any means whatsoever, is strictly prohibited, except with GBA's specific written permission. Excerpting, quoting, or otherwise extracting wording from this document is permitted only with the express written permission of GBA, and only for purposes of scholarly research or book review. Only members of GBA may use this document as a complement to a geotechnical-engineering report. Any other firm, individual, or other entity that so uses this document without being a GBA member could be commiting negligent or intentional (fraudulent) misrepresentation.

CONSULTANTS • ENVIRONMENTAL • FACILITIES • INFRASTRUCTURE

San Antonio, TX								
Austin, TX	Dallas , TX	McAllen, TX						
Brownsville, TX	El Paso, TX	Mexico						
Corpus Christi , TX	Houston, TX	Salt Lake City, UT						

SECTION 00 52 13 — AGREEMENT FORM - STIPULATED SUM

PART 1 - GENERAL

1.1 AGREEMENT FORM:

- A. The modified "Standard Form of Agreement Between Owner and Contractor where the Basis of Payment is a Stipulated Sum", AIA Document A101, 2007 Electronic Format Edition, will be the form used as a Contract for this Project.
- B. General Condition AIA A201 will be used in this project. See attached
- C. A copy of the Standard AIA Document may be examined at the office of the Architect. Copies may be purchased from the American Institute of Architects, 1735 New York Avenue, N.W., Washington, D.C., 20006.
- D. Modification may be made to the above Agreement & General Conditions A201 form or an Owner provided agreement and general conditions may be utilized. Either of which will be provided to contractor for review upon award of project, for final execution of the contract. See attached.
- E. Section 00 73 00 Supplementary Conditions forms part of this Agreement.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

SECTION 00 61 00 — 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 not 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 thereto a certificate and current copy of his Power of Attorney.
- Any Payment Bond and Performance Bond furnished pursuant to the provisions of Art. 5160, Vernon's D. 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 CORPORATED SURETIES PROVIDING THE PAYMENT BOND AND PERFORMANCE BOND AND THE LOCAL AGENT.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

SECTION 00 62 76.13 — TAX EXEMPT ORGANIZATION CERTIFICATE

PART 1 - GENERAL

1.1 DEFINITION

- A. This Contract is to be performed for an exempt organization as defined by Title 2; Subtitle E; Chapter 150 of the Texas Limited Sales, Excise and Use Tax Act and Section 151.311 of the State Statutes. The Owner will furnish the Contractor proof or Certificate of Exemption upon award of contract.
- B. Bidder shall not include sales tax in their Bid.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

SECTION 00 73 00 — SUPPLEMENTARY CONDITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS: SUPPLEMENTARY CONDITIONS

- A. The Supplementary Conditions modify, change, delete from or add to the General Conditions and shall apply to each and every Section of the Work as though written in full therein.
- B. The following paragraphs and subparagraphs take precedence over the General Conditions. Where any part of the General Conditions is modified or deleted by the Supplementary Conditions, the unaltered provisions remain in effect.
- C. Paragraph numbers and titles refer to like numbers and titles in the General Conditions.

1.2 EXECUTION, CORRELATION AND INTENT

- 1.3 Add the following subparagraphs.
- 1.4 1.2.6 Scope paragraphs placed at the beginning of the SECTIONS present a brief indication of the principal Work included in that SECTION, but do not limit Work to subject mentioned nor purport to itemize Work that may be included.
- 1.5 The Relation of Specifications and Drawings shall be equal in authority and priority. Should they disagree in themselves, or with each other, bids shall be based on the most expensive combination of quality and quantity of work indicated. The appropriate Work, in the event of the above mentioned disagreements, shall be determined by the Architect, at no additional cost to the Owner.
- 1.6 1.2.8 Failure to report a conflict in the Contract Documents, prior to opening of Proposal, shall be deemed evidence that the Contractor has elected to proceed in the more expensive manner, at no additional cost to the Owner.
 - A. 1.2.9 The Specifications have been partially "streamlined" and some words and phrases have been intentionally omitted. Missing portions shall be supplied by inference as with notes on drawings.
 - B. 1.2.10 The words "approved", "inspected", "directed", "selected", and similar words and phrases shall be presumed to be followed by "by Architect". The words "satisfactory", "submitted", "reported", and similar words and phrases shall be presumed to be followed by "to Architect". Words like "install", "provide", "locate", "furnish", and "supply" shall be construed to include complete furnishing and installing of construction. Words like "Bids", "Bidders", shall be construed to be "Proposals", Proposers", or "offers", offerors", respectively.
 - C. INFORMATION AND SERVICES REQUIRED OF THE OWNER
 - D. Delete 2.2.5 and replace with the following subparagraph.
 - E. 2.2.5The General Contractor will be furnished, free of charge, fifteen (15) sets of Drawings and Specifications for use in construction of this Project. Additional Drawings and Specifications will be

furnished the General Contractor at the Contractor's expense, but shall remain the property of the Architect. Cost of additional sets will be the cost of reproduction.

- F. LABOR AND MATERIALS
- G. Add the following subparagraphs 3.4.3 and 3.4.4 to 3.4:
- H. After the Contract has been executed, the Owner and the Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 1 of the Specifications).
- I. By making requests for substitutions based on subparagraph 3.4.3 above, the Contractor:
 - 1. Represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
 - 2. Represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;
 - 3. Will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects, all at no additional cost to the Owner.
- 7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.3.1 CHANGE TO READ:

Mutual acceptance of a lump sum properly itemized in accordance with 7.3.6.1, 7.3.6.2 and 7.3.6.3. Items listed in 7.3.6.4 and 7.3.6.5 shall be a part of the overhead scheduled 7.3.10 following. Items shall be supported by sufficient substantiating data to permit evaluation;

7.3.6 In the first sentence, delete the words "a reasonable allowance for overhead and profit" and substitute "an allowance for overhead and profit in accordance with Clauses 7.3.10.1 through 7.3.10.6 following:

7.3.6.4 DELETE the final "and" then add the following to the sentence: are a part of overhead schedule in 7.3.10 following".

7.3.6.5 ADD the following to the sentence: "are apart of overhead schedule in 7.3.10 following".

ADD the following subparagraph 7.3.10 to 7.3:

7.3.10 In subparagraph 7.3.6, the allowance for the combined and profit included in the total cost to the Owner shall be based on the following schedule:

- 1. For the Contractor, for Work performance by the Contractor's own forces, 10 percent of the cost.
- 2. For the Contractor, for Work performance by the Contractor's contractor, 6 percent of the amount due to the Sub-subcontractor.
- 3. For each Subcontractor or Sub-subcontractor involved, for Work performed by that Subcontractor's or Sub-subcontractor's own forces, 10 percent of the cost.
- 4. For each Subcontractor, for Work performed by the Subcontractor's, Sub-subcontractor's, 6 percent of the amount due the Sub-subcontractor.
- 5. Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.6.
- 6. In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change involving over \$500.00 be approved without such itemization.
- 8.1 DEFINITIONS

Add the following subparagraph.

8.1.5 The term working Day as used in the Contract Documents for extensions of time shall mean normal working day excluding weekends and legal holidays.

8.3 DELAYS AND EXTENSIONS OF TIME

Delete paragraph 8.3.2 and replace with the following subparagraph.

8.3.2 Any claim for extension of time shall be made in writing to the Architect not more than ten (10) days after the commencement of the delay; otherwise, it shall be waived. In case of a continuing delay only one claim is necessary. In case of claims for extensions of time because of adverse weather, such extensions of time shall be granted only when such adverse weather prevented the execution of major items of Work on normal working days

and exceeds the number of days included in the Contract time. The Contractor shall provide an estimate of the probable effect of such delay on the progress of the Work. In the event an extension of time is granted such extension shall be the complete claim allowed. Contractor shall not be entitled to additional compensation such as, but not limited to, compensable extended overhead or lost profit.

9.6 PROGRESS PAYMENTS

Add the following subparagraph to 9.6.1

1. Unless otherwise indicated in the Agreement, the Owner will pay ninety-five (95%) percent of the amount due the Contractor on account of progress payment until final payment.

Add the following paragraphs to 9.11 to Article 9:

9.11 LIQUIDATED DAMAGES:

9.11.1 If the Contractor neglects, fails or refuses to complete the Work within the time specified in the Contract, or any proper extension thereof granted b the Owner, then the Contractor does hereby agree, as part consideration of the awarding of this Contract, to pay the Owner the amount of *TWO HUNDRED FIFTY DOLLARS (\$250.00)* not as a penalty but as a liquidated damages for such breach of Contract as hereinafter setforth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the Contractor for completing the Work.

9.11.2 The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would, in such event, sustain.

9.11.3 TIME SPECIFIED IN CONTRACT IS AS FOLLOWS:

The Undersigned agrees to commence work within ten (10) days of Notice to Proceed and to substantially complete the work on or before <u>August 12, 2019.</u>

11.1 Article 11.1 Modify to include the following:

The Contractor shall furnish three (3) copies of insurance certificates to the Architect's office two (2) days after award of the project and before signing of the contract. The Certificate of Insurance shall include thirty (30) Day Notice of Cancellation; Architect and Owner shall receive the same notice in regard to any policy changes.

Owner and Architect shall be named as additional insured by the Contractor but not with respect to payment of premiums due under Contractor's policies. Coverage shall include any off site-work on adjacent public or private property.

Insurance Company/Carrier issuing the certificates must be listed by A.M. Best and have an "A" rating or better and based in the United States Mainland.

The insurance as required in Article 11.1 shall have "Minimum Limits" as follows:

- A. WORKER'S COMPENSATION INSURANCE: Statutory Requirements-
 - 1. All States Endorsements (Broad)
 - 2. Voluntary Compensation

B.

- 3. Waiver of Subrogation Endorsement
- MINIMUM EMPLOYER'S LIABILITY: \$100,000/\$100,000/\$500,000
- C. COMPREHENSIVE GENERAL LIABILITY INSURANCE MINIMUM LIABILITY AND COVERAGE:
 - 1. Bodily Injury \$500,000 each person/\$500,000 each occurrence
 - 2. Property Damage \$100,000 each occurrence/\$100,000 aggregate

OR-

- 3. \$500,000 Combined Single Limit Per Occurrence Bodily Injury and Property Damage.
 - a. Premises and operations coverage
 - b. Explosion and collapse hazard coverage
 - c. Underground hazard coverage
 - d. Products/completed operation hazard coverage with limits and coverage continuing one (1) year after job completion.
 - e. Broad Form property damage coverage
 - f. Personal injury coverage
 - g. Waiver of subrogation endorsement
 - h. Contractual liability (Broad Form) coverage
 - i. Independent contractors coverage (Owners, Architects, and Contractors protective)

NOTE: If General Liability coverage is written on a "Claims Made" basis, the Certificate of Insurance should so indicate. If so written, Contractor agrees that coverage so certified beyond job completion and that coverage written will apply to claims made DURING CONSTRUCTION AND FOR ONE (1) YEAR THEREAFTER. D.

- AUTOMOBILE LIABILITY INSURANCE with minimum limits of:
 - Bodily Injury: \$250,000 each person/\$500,000 each occurrence 1
 - Property Damage: \$250,000 each occurrence/\$500,000 Combined Single Limit per Occurrence 2. Bodily Injury and Property Damage.
 - Automobile Liability Insurance shall include coverage for owned, non-owned, and hired vehicles 3. with limits not less than shown above.
- OWNER'S AND CONTRACTOR'S PROTECTIVE LIABILITY:
 - Bodily Injury \$500,000 Single limit each occurrence
 - Property Damage \$250,000 each occurrence/\$250,000 aggregate 2.
- F. UMBRELLA LIABILITY:

1.

E.

Minimum combined single limits \$100,000 with same inception and expiration dates as underlying liability policies and with coverage no less broad than in primary program.

G. BUILDER'S RISK INSURANCE:

The Contractor shall FURNISH AND PAY FOR and issue a Certificate of Builder's Risk Coverage to the Owner/Architect in accordance with the General Conditions and Conditions of the Contract.

ARTICLE 11.4: PERFORMANCE BOND AND PAYMENT BOND: H.

Delete in its entirety and substitute the following:

11.4.1: Prior to signing of the Contract, the CONTRACTOR, at HIS/HER OWN EXPENSE, shall furnish a Performance Bond, and a Labor and Materials Payment Bond for one hundred (100%) percent of the Contract price on such form and with such sureties as the Owner may approve. Surety company furnishing the Bond must be listed by A.M. BEST and have an "A" rating or better and be based in the United States Mainland and authorized to provide such bonds on public work in the State of Texas.

Any Payment Bond and Performance Bond furnished pursuant to the provisions of Art. 5160, Vernon's J. 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 district.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

SECTION 00 73 43 — WAGE RATE 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 GENERAL NOTES

- A. Do<u>not</u> dimension the drawings. Any dimensions, questions, should be directed to the Architect or Engineer.
- B. Contractor shall protect all streets and sidewalks and shall make all necessary repairs at his own expense.
- C. Shall at all times protect the excavations, trenches, and/or the building from damage from rain water, ground water, backing up drains or sewers and all other water. He shall provide all pumps and equipment and enclosures to provide this protection.
- D. Contractor shall provide all shoring, bracing and sheathing as required for safety and proper execution of the work and remove same when work is completed. Contractor shall be responsible for all scaffolding, shoring, bracing, sheathing, temporary construction and temporary walkways, etc., and shall hold harmless the Owner and Architect from any injury or litigation as a result of causes related to any scaffolding, shoring, bracing, sheathing, temporary construction and temporary walkways.
- E. Contractor shall comply with the Trench Safety Law Requirements.

1.3 WAIVER OF LIEN:

A. A. In submitting a Bid, Contractor, if awarded the Contract, explicitly warrants that the Owner shall be held free of any claim or lien of any nature resulting from Contractor's pursuance or prosecution of the work. This shall cover any third party lien in any manner whatsoever concerning Contractor's performance or payment on this project.

1.4 **PREVAILING WAGES**:

A. A. Article 5159a, Vernon's Annotated Texas Civil Statutes as below noted apply to this project.
"Not less than the general prevailing rate of per diem wages for work of a similar character in the locality В. in which the work is performed, and not less than the general per diem wages for legal holiday and overtime work, shall be paid to all laborers, workmen and mechanics employed by or on behalf of the State of Texas, or by or on behalf of any county, district or other political subdivision of the State, engaged in the construction of public works, exclusive of maintenance work".

1.5 CONTRACTOR'S ASBESTOS FREE AFFIDAVIT:

- In order to protect staff, employees and public in general from any unnecessary exposure to asbestos A. fibers, the Asbestos Hazard Emergency Response Act prohibits the use of asbestos containing materials in all forms in the construction and operation of this facility.
- B. Failure to complete this waiver constitutes non-compliance with the job specifications. This document shall be attached to the Contract between Owner and Contractor.

1.6 **AFFIDAVIT:**

- I, certify that I am familiar with the materials used in the construction of, and incorporated into, the A. construction described below. I further certify that to the best of my knowledge and belief no asbestos containing materials, either friable or otherwise were used in the process of constructing or incorporated into the construction.
- Β. The undersigned, being duly sworn upon his/her oath deposes and says that he/she is the person making the foregoing statements and that they are made in good faith and are true in every respect.
- С. Contractor's signature:

STATE OF

COUNTY OF

I, ______, a Notary Public in and for said County, in the State aforesaid, DO D.

THEREBY CERTIFY THAT ______, personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day in person, and acknowledge that he/she signed, sealed, and delivered said instrument as his/her free and voluntary act, for the uses and purposes herein set forth.

	GIVEN , DATE OF	UNDER	MY	HAND , 20	AND	NOTARIAL	SEAL	THIS
	NOTARY P	UBLIC:			,			
	MY COMM	ISSION EXPI	RES:		,			
	(NOTARY S	SEAL)						
PART 2	- PRODUCTS	(Not Applica	ble)					
PART 3	- EXECUTIO	N (Not Applic	able)					
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)

SECTION 01 21 00 — ALLOWANCES

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. Section 01 20 00 – Price and Payment Procedures.

1.3 CONTINGENCY ALLOWANCE

A. Include in the Contract, a stipulated sum of Fifteen Thousand Dollars, (\$15,000.00) for use upon Architect's instruction.

1.4 PROCEDURES FOR MANAGING ALLOWANCES

- A. Contractor's costs for Products, delivery, installation, labor, payroll, taxes, bonding, and equipment rental will be included in Construction Change Directives authorizing expenditure of funds from Allowances.
- B. Funds will be drawn from Allowances only by Construction Change Directives.
- C. At closeout of Contract, funds remaining in Allowances will be credited to Owner by Change Order.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

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:
То:	Date:
	A/E Project Number:
Re:	Contract For:
Specification Title:	Description:
Section: Page:	Article/Paragraph:
Proposed Substitution:	
Manufacturer: Addre	ess: Phone: Model No.:
Attached data includes product description, s	specifications, drawings, photographs, and performance and test data adequate for evaluatio
Attached data also includes a description of installation.	changes to the Contract Documents that the proposed substitution will require for its prope
 Proposed substitution will have no adver Proposed substitution does not affect dir Payment will be made for changes to substitution. Submitted by:	rse effect on other trades and will not affect or delay progress schedule. nensions and functional clearances. b building design, including A/E design, detailing, and construction costs caused by th
Firm:	
Address:	
Telephone:	
A/E's REVIEW AND ACTION	
 Substitution approved - Make submittals i Substitution approved as noted - Make sul Substitution rejected - Use specified mate Substitution Request received too late - U 	in accordance with Specification Section 01340 Submittals bmittals in accordance with Specification Section 01340 Submittals rials. se specified materials.
Signed by:	Date:
Supporting Data Attached: Drawings	Product Data Samples Tests Reports
END OF SECTION	
END OF SECTION	
SUBSTITUTION PROCEDURES	4/3/2019 01 25 00 - 3

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)

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 <u>six (6)</u> 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:

4.

- a. Architect/Engineer.
- b. General Contractor.
- c. Manufacturer of the specified materials and equipment.
- 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 <u>six (6)</u> 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:
 - Name and location of Project.
 - 2. Names of:

1.

- 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 <u>fourteen (14)</u> 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.

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)

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, ventilation, water, and sanitary facilities.
- B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.
- C. Construction Facilities: Progress cleaning and project signage.

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 VENTILATION

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidify, and to prevent accumulation of dust, fumes, vapors, or gases.

1.5 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.

1.6 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.

1.7 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.

1.8 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.

1.9 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.

1.10 SECURITY

- A. Provide security and facilities to protect Work 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.

1.11 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.

1.12 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.

1.13 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)

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.
- 1. 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.

SECTION 02100 - SITE PREPARATION

PART 1 - GENERAL

- 1.01 SECTION INCLUDES:
 - A. Demolition of existing site elements per Demolition Plan and/or as required for installation of new work.
 - B. Clearing of site.
- 1.02 RELATED SECTIONS:
 - A. Temporary erosion and sediment control during construction Section 02150.
 - B. Earthwork Section 02200 or Section 02202 and/or Section 02222
- 1.03 NOTIFICATION TO OWNERS OF UTILITY LINES AND EQUIPMENT:
 - A. Notify any corporation, company, individual or local authority owning conduits, wires, pipes

or equipment on site that is affected by work.

B. Arrange for removal or relocation of indicated items and pay any fees or costs in conjunction

with removal or relocation, except as otherwise noted.

- C. Cap lines in accordance with instructions of governing authorities or Owners.
- 1.04 **PROTECTIONS**:
 - A. Protect trees, plants and other landscape features designated to remain.
- 1.05 EXPLOSIVES:

A. Use of explosives is strictly prohibited.

PART 2 - PRODUCTS - NONE IN THIS SECTION

PART 3 - EXECUTION

- 3.01 PREPARATION:
 - A. Verify that abandoned utilities have been properly disconnected and capped.
 - B. Verify that barricades and other protective measures are in place.

3.02 CLEARING:

- A. Remove existing scrub trees and shrubs, including root systems.
- B. Strip and clear building areas, or areas requiring cutting or filling, free of vegetation. Leave construction areas clean, free of vegetation and debris, and ready for earthwork.

C. Remove debris and trash from site.

SECTION 02102-CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

- A. Cleaning and grubbing shall consist of the removal of trees, stumps, brush, roots, vegetation, logs, rubbish, and other objectionable matter within the project site limits described in the specifications or as shown on plans.
- B. Cleaning and grubbing shall be done in advance of grading operation. Grubbing may be done simultaneously with excavation, if the cuts are over 3 feet in depth and objectionable matter is removed as specified.
- C. Clearing and Grubbing shall consist of the disposal of all debris resulting from the work specified herein.

1.02 PROTECTION OF ADJACENT WORK:

- A. Provide protection necessary to prevent injury or damage to existing improvements, adjacent property, utilities and other facilities, and trees and plants, indicated to remain in place.
- B. Protect improvements on adjoining properties and all areas outside indicated construction areas from injury or damage.
- C. Restore damaged improvements to their original condition, as acceptable to the Engineer and property owners.
- D. Conduct site clearing and grubbing operations to ensure minimum interference with road, streets, walks, and other adjacent, occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

PART 2 - PRODUCTS

- 2.01 MATERIALS:
 - A. Provide all required personnel, equipment, and materials required to perform the work as specified.

PART 3 - EXECUTION

3.01 CLEARING:

- A. Clear all areas covered by dikes, roads, structures and embankments within project limits unless otherwise shown in plans.
- B. Remove all saplings, brush, down-timber and debris unless shown or directed otherwise.
- C. Use tree wound paint to treat scars, gashes or limbs stubs on trees not removed.

3.02 GRUBBING:

A. Trees, stumps, root systems, rocks and other obstructions shall be removed to the depths shown when they fall within the construction templates for the following items:

1.	Footings	18-inches below bottom of footing.
2.	Sidewalks (or other types of walks)	12-inches below bottom of walk.
3.	Roadways or Streets	24-inches below bottom of base material.
4.	Parking Areas	24-inches below bottom of base material.
5.	Grassed Areas	18-inches below top soil.
6.	Fills	24-inches below bottom of fill.

B. Blasting not permitted.

3.03 REMOVAL OF DEBRIS AND CLEANUP

- A. Burn as permitted by regulating agencies or the Engineer as work progresses.
- B. Unguarded fires will not be permitted.
- C. Permits will be obtained, where required, for necessary burning or disposal sites.
- D. Dispose of all waste materials not burned by removal from site.
- E. Materials cleared and grubbed shall be the property of the Contractor and shall be his responsibility for disposal.

PART 4 - MEASUREMENT AND PAYMENT

- 4.01 CLEARING AND GRUBBING:
 - A. Clearing and Grubbing shall be measured for payment either in <u>acres</u> or <u>by lump sum</u> only for areas indicated on the plans, or as provided in the proposal and contract.
 - B. When not listed as separate contract pay item, Clearing and Grubbing shall be considered as incidental work, and the cost thereof shall be included in such contract pay items 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 in incidentals required for the work, all in accordance with the plans and these specifications.

SECTION 02150

TEMPORARY EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Temporary measures required to control erosion and sediment during construction. This includes measures to meet the requirements of the National Pollution Discharge Elimination System (NPDES) administered by the Environmental Protection Agency (EPA).
- B. Temporary hay bale dike.
- C. Stabilized construction entrance.
- D. Silt fence.
- E. Rock check dam.
- F. Sediment basin with stone and pipe outlet
- G. Diversion dike.
- H. Storm Water Pollution Prevention Plan (SWP3).

1.02 RELATED SECTIONS:

- A. Grass seeding for slope protection and erosion control Section 02270.
- B. Site Preparation Section 02100.
- C. Earthwork Section 02200 or Section 02202 and/or 02222

1.03 REFERENCES:

Α.	ASTM D3786 -	Hydraulic Bursting Strength of Knitted Goods and Non-woven Fabrics. (Mullen Burst)
B.	ASTM D3787 -	Bursting Strength of Knitted Goods; Constant Rate of Traverse (CRT) Ball Burst Test
C.	ASTM D4355 -	Deterioration of Geotextiles From Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
D.	ASTM D4491 -	Water Permeability of Geotextiles by Perrnittivity.
E.	ASTM D4533 - Index Grab	Trapezoidal Tearing Strength of Geotextiles.F. ASTM D4632 Breaking Load and Elongation of Geotextiles. (Tensile Strength).
F.	ASTM D4751 -	Determining the Apparent Opening Size of a Geotextile.
H.	ASTM AI 16, -	Zinc Coated (Galvanized) Steel Woven Wire Fence Fabric.

- I. ASTM D698 Test for Moisture Density Relations for Soils (Standard).
- J. Texas Department of Transportation (TXDOT) 1993 Standard Specifications for Construction of Highways, Streets, and Bridges. Measurement and payment sections do not apply. Item 432 - Rip Rap.
- 1.04 SUBMITTALS:
 - A. Procedures for Submittals: Section 01300.
 - B. Product Data:
 - 1. Sift fencing.
 - 2. Non-woven filter fabric.
 - 3. Erosion control and revegetation mat
 - C. Prepare and submit a Storm Water Pollution Prevention Plan (SWP3).
 - D. Inspection Reports and Certificates:
 - 1. Submit period inspection reports and certificates required for SWP3.
 - 2. Submit Contractor/Subcontractor certifications required for SWP3.
 - E. Submit revisions or modifications to the erosion and sediment control plan and SWP3.

1.05 MAINTENANCE:

A. Maintain erosion control devices as necessary to comply with NPDES. This includes any revisions or modifications to the plan. Any work required for modifications, revisions and maintenance shall be the responsibility of the Contractor and shall -not be a basis for additional compensation.

PART 2 - PRODUCTS

- 2.1 MATERIALS:
 - A. Hay bales, if used, shall weigh a minimum of (50) pounds and shall be at least thirty (30) inches 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 two months before being replaced. However, if weather conditions cause biological degradation of the hay bales, they shall be replaced sooner than the two month time period to prevent a loss of structural integrity of the hay bale dike.
 - B. Stone material at all drainage structures shall consist of stone rip-rap conforming to TXDOT Standard Specification Item 432 and shall have gradation and be placed as shown on the plans and in a layer of at least 24 inches thick. Stone material for rock check dams shall consist of only well graded crushed rock, 4-8 inches in diameter, and shall be placed as detailed on plans. Stone material for stabilized construction exit shall consist of 3" to 5" crushed rock mixed with Type "A"" Flexbase to create a drivable surface and shall be placed as shown on the plans.
 - C. Geotextile Fabrics shall be a non-woven polypropylene fabric designed specifically. for use as a soil filtration media. Fabric shall have an approximate weight of 8 oztyd,2.

D. Geotextile Silt Fence Fabric shall be a nylon reinforced polypropylene woven fabric having

a reinforcing cord running the entire length to the top edge of the fabric.

Representative Manufacturer Mirafi, Inc. sift fence, Amoco (2130) or owner approved equal.

E. Fence Posts for Sift Fence of sufficient length and strength to support the silt fence system.

PART 3 - EXECUTION

- 3.01 EXAMINATION AND PREPARATION:
 - A. Submit SWP3 and the erosion and sediment control plan and modify as required for the Contractor's construction sequence. Modifications shall maintain conformance with the Contractor's storm water pollution prevention plan and the requirements of NPDES. Work and materials required for installation, modification and maintenance of the Erosion Control System shall be incidental to the contract.
 - B. Locate and protect survey horizontal and vertical control.

3.02 TEMPORARY HAY BALE DIKE:

- A. Install where shown on the plans or as needed for erosion control.
- B. Hay bales shall be embedded a minimum of four (4) inches and securely anchored using 3/8. inch diameter steel stakes or 2" x 2" wood stakes driven through the bales into the ground a minimum of six (6) inches. Hay bales are to be placed end to end directly adjacent to one another leaving no gap between them.
- C. Hay bale dikes are to be used in locations receiving overland sheet flow only.

3.03 STABILIZED CONSTRUCTION EXIT

- A. A temporary construction exit shall be installed at any point where traffic will be leaving the construction site to a public right-of-way, street, alley, sidewalk or parking area. The purpose of a stabilized construction exit is to reduce or eliminate the tracking or flowing of sediment onto public rights-of-way. The exit must be properly graded or incorporate a drainage swale to prevent runoff from leaving the construction site. The length of the exit shall be as required, but not less than 100 feet and the width shall be at least 20 feet. The stabilized exit shall be constructed of rock as described in 2.1.8. and shall be completely underlined with geotextile filter fabric described in 2.1.C, Value 1.
- B. The temporary construction exit shall be maintained in a condition which will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top dressing with additional stone as conditions demand and repair and/or clean out of any measures used to trap sediment. All sediment spilled, dropped, washed or tracked onto public rights-of-way must be removed immediately by the Contractor.

C. When necessary, wheels must be washed or brushed to remove sediment prior to entrance

onto public right-of-way. When washing is required, it shall be done on an area stabilized with crushed stone which drains into an approved sediment trap or sediment basin. All sediment shall be prevented from entering any storm drain, ditch or watercourse using approved methods.

3.04 SILT FENCE:

A. Silt Fence: Shall consist of nylon reinforced polypropylene woven fabric supported by posts set a minimum depth of 18 inches and spaced not more than 6 feet on center. A 6-inch wide trench is to be cut 6 inches deep at the toe of the fence on the uphill side to allow the fabric to be laid below the surface and back filled with gravel. Fabric shall have a 6-inch, double overlap securely fastened at a post at abutting ends, and shall be joined such that no leakage or bypass occurs. Remove accumulated sediment when the depth of sediment reaches 6 inches.

3.05 ROCK CHECK DAM:

A. Rock Check Dams shall be constructed at locations shown on the plans and in swales as needed to reduce velocity in swales. Geotextile fabric as described in 2.1.C., Value I shall be placed beneath the rock and shall conform to these specifications. Rock shall conform to these specifications.

3.06 DIVERSION DIKE:

- A. Diversion dikes, if used by the Contractor, shall be installed prior to and maintained for the duration of construction and shall intercept no more than five (5) acres of runoff. Dikes shall have a minimum top width of 2'-0" and a minimum height Of Compacted fill of 18" measured from the top of the existing ground at the upslope toe to top of the dike and having side slopes of 3:1 or flatter. The channel which is formed by the dike must have a minimum slope of one (1) percent for the entire length to an outlet. When the slope exceeds three (3) percent, or velocities exceed one foot per second (regardless of slope), stone stabilization (Type "Am rip-rap) is required. Plant grass on dikes not requiring stone stabilization.
- 3.07 STORM WATER POLLUTION PREVENTION PLAN (SWP3):
 - A. The Contractor is required to prepare the SWP3 required for this project.
- 3.08 NOTICE OF INTENT (NOI), NOTICE OF TERMINATION (NOT):
 - A. Contractor shall submit a Notice of Intent (NOI) at least 48 hours prior to the start of construction.
 - B. Contractor shall submit a Notice of Termination (NOT) as required by the NPDES regulations.
- 3.09 At the close of this contract the Contractor shall remove the temporary erosion control devices when permanent facilities are in place.

SECTION 02202 - EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

- A. Clearing and Grubbing as required in order to perform earthwork as shown within contract drawings.
- B. Stripping 6" of existing topsoil, stockpiling on-site and re-spreading topsoil as directed by Owner's Representative
- D. Excavation and Fills to grades represented within drawings.
- E. Compaction of Embankments and Fills to specified densities.
- F. Definitions:

"Excavation" consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.

"Density" is referred to as a percentage of the ASTM D698. Standard Proctor Density

1.03 QUALITY ASSURANCE

- A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Testing and Inspection Service: At Contractor's expense, testing laboratory to perform soil testing and inspection service for quality control testing during earthwork operations. Testing laboratory to be selected by Owner.

1.04 SUBMITTALS

- A. Test Reports: Submit following reports directly to Owner's Representative from the testing laboratory with a copy to the Owner.
 - 1. Test reports on borrow material (as applicable)
 - 2. Field density test reports.

- 3. One optimum moisture-maximum density curve for each type of soil encountered.
- 4. Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.
- B. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil bearings. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn therefrom by Contractor. Data is made available for convenience of Contractor.
 - 1. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.
- C. Existing Utilities: Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.
 - 1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult Utility Owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of Utility Owner.
 - 2. Do not interrupt existing utilities serving facilities occupied and used by Owner or others during occupied hours except when permitted in writing by Owner or Owner's Representative and then only after acceptable temporary utility services have been provided.

Provide a minimum of forty eight (48) hour notice to Owner and receive written notice to proceed before interrupting any utility.

- 3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.
- D. Use of Explosives: The use of explosives is not permitted.
- E. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.
 - 1. Operate warning lights as recommended by authorities having jurisdiction.
 - 2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.
 - 3. Perform excavations within drip line of large trees to remain by hand and protect root system from damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with
burlap. Paint root cuts of 1" diameter and larger with emulsified asphalt tree paint.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. Definitions:
 - 1. Satisfactory soil materials: are those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP.
 - 2. Select Backfill : Satisfactory soil materials free of clay, rock, or gravel larger than 2" in any dimension, debris, waste, frozen materials, and other deleterious matter and having a PI < 25.

PART 3 - EXECUTION

3.01 EXCAVATION

- A. Excavation is Unclassified and includes excavation to subgrade elevations indicated regardless of character of materials and obstruction encountered.
- B. Unauthorized Excavation:
 - 1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Owner's Representative. Unauthorized excavation, as well as remedial work directed by the Owner's Representative, shall be at Contractor's expense.
 - 2. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to Owner's Representative.
 - 3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavation of same classification, unless otherwise directed by Owner's Representative.
- D. Additional Excavation:
 - 1. When excavation has reached required subgrade elevations, notify the Owner's Representative who will make an inspection of conditions.

- 2. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by Owner's Representative.
- 3. Removal of unsuitable material and its replacement as directed will be paid per contract cost.
- 4. Stability of Excavations:
 - A. Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
 - B. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- E. Trench Safety Systems:

A trench shoring safety plan shall be required complying with latest OSHA standards for all trench excavations exceeding 5' in depth.

- F. Temporary Drainage / Dewatering:
 - 1. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding property.
 - 2. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well pints, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavation.
 - 3. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavation to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.
- G. Material Storage:
 - 1. Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
 - 2. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

- 3. Dispose of excess soil material at locations on site as directed by Owner's Representative.
- H. Cold Weather Protection: Protect excavation bottoms against freezing when atmosphere temperature is less than 35° F. (1° C.).

3.02 COMPACTION

- A. General: Control soil compaction during construction providing minimum percentage of density specified for each area classification indicated below.
- B. Percentage of Density Requirements:
 - 1. Structures, Building Slabs and Steps: in accordance with Structural Drawings. (as applicable)
 - 2. Roadways, parking areas, sidewalks or tracks: Compact subgrade and each layer of backfill or fill material at 95% standard Proctor ASTM D-698-91 at a moisture content of no more than 3% above optimum moisture for cohesive material or 95% maximum density for cohesionless material.
 - 3. Open areas, landscapes, sport fields: Compact subgrade and each layer of backfill or fill material at 90% standard Proctor ASTM D-698-91 at a moisture content of no more than 3% above optimum moisture for cohesive material or 90% maximum density for cohesionless material.
- C. Moisture Control:
 - 1. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material to prevent free water appearing on surface during or subsequent to compaction operations.
 - 2. Remove and replace or scarify and air dry soil material that is too wet to permit compaction to specified density.
 - 3. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture contact is reduced to a satisfactory value.

3.03 BACKFILL AND FILL

- A. Under grassed or open areas: Onsite excavated or borrow material free of: clay, rock or gravel larger than 2" in any dimension, site debris, frozen material and deleterious matter and vegetation.
- B. Under roadway, parking and sidewalk: Select backfill. In the event the excavated material or "cuts" do not meet the requirements of select backfill, Engineer shall determine suitability of onsite excavated material. Additional borrow material as required shall be paid for by owner.
- C. Under Buildings: (See Structural Drawings as applicable)
- D. Ground Surface Preparation:
 - 1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
 - 2. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture condition to optimum moisture content, and compact to required depth and percentage of maximum density.
- E. Placement and Compaction:
 - 1. Place backfill and fill materials in layers not more than 8" in loose depth for material compacted by heavy compaction equipment, and not more than 4" in loose depth for material compacted by hand operated tampers.
 - 2. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture contact. Compact each layer to required percentage of maximum density. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
 - 3. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping or conduit to approximately same elevation in each lift.
- 3.04 GRADING
 - A. General:

1. Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within 0.10' above or below required subgrade elevation.

2. Grade areas to prevent ponding

3.05 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction: Allow and coordinate with testing service to inspect and approve subgrades and fill layers before further construction work is performed.
 - 1. Roadways, Parking Areas and Building Slab Subgrade: In each compacted fill layer, make at least one (1) field density test of subgrade for every 50,000 sq. ft. of paved area or building slab, but in no case less than three (3) tests.
 - All other areas: In each compacted fill layer, make at least one (1) field density test for every 75,000 sq. ft. of fill area, but in no case less than two (2) tests.
 - 3. In the event any field density test fail, subsequent density test within this area on this compacted fill layer shall be at the expense of the Contractor.

If in the opinion of the Owner's Representative based on testing labratory reports or inspection, subgrade or fills which have been placed that do not meet the requirements of this specification, Contractor shall provide additional compaction and testing at his expense.

3.06 MAINTENANCE

- A. Protection of Graded Areas:
 - 1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
 - 2. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.
- C. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.07 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash and debris, and dispose of it off Owner's property.

END OF SECTION

SECTION 02230-EXCAVATION

PART I - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

- A. This work shall consist of excavating and properly utilizing, or otherwise satisfactorily disposing of, all excavated materials, of whatever character, within the limits of work.
- B. Excavation shall also consist of constructing, compacting, shaping and finishing of all earthwork in designated areas on the plans, as specified herein, and in conformity with the required line grades and typical cross sections or as directed by the Engineer.
- C. When not otherwise included, this items shall include the work described in Section 2101 - <u>Preparation of Right of Way</u>, Section 2102 - <u>Clearing and Grubbing</u>, Section 2236 -<u>Embankment</u>, Section 2238 - <u>Removal of Concrete</u>, and Section 2210 - <u>Subgrade Preparation</u>.

PART II - PRODUCTS

2.01 CLASSIFICATION

A. All excavations shall be unclassified and shall include all materials encountered regardless of their nature or the manner in which they are removed.

PART III - EXECUTION

- 3.01 CONSTRUCTION METHODS
 - A. Prior to commencing this work, all erosion control and tree protection measures required shall be in place and all utilities located and protected.
 - B. Construction equipment shall not be operated within the drip line of trees, unless otherwise indicted.
 - C. Construction materials shall not be stockpiles under the canopies of trees. No excavation or embankment shall be placed within the drip line of trees until tree wells are constructed.
 - D. All excavation shall be performed as specified herein and shall conform to the established alignment, grades and cross sections.
 - E. Suitable excavated materials shall be utilized, insofar as practical, in constructing required embankments.
 - F. The construction of all embankments shall conform to Section 2236 <u>Embankment</u>. No material shall be stockpiled within the banks of a waterway.
 - G. Unsuitable excavated materials or excavation in excess of that needed for construction shall be known as "Waste" and shall become the property of the Contractor. It shall become his sole responsibility to dispose of this material off the limits of the right of way in an environmentally sound manner at a permitted disposal site.
 - H. Adequate dewatering and drainage of excavation shall be maintained throughout the time

required to complete the work.

PART IV - MEASUREMENT AND PAYMENT

- 4.01 MEASUREMENT:
 - A. Measurement of the volume of excavation in cubic yards by the average end areas. Cross sectional areas shall be computed from existing ground section to the established line of the subgrade, as shown on typical sections for the limits of the right-of-way or other work limits, including parkway slopes and sidewalk areas.
 - B. Measurement of the area in square yards of surface area excavated as shown on the typical sections included in the plans.
 - C. Measurement of the volume of excavation is in cubic yards, based upon the average end areas taken from pre-construction cross sections and planned grades. The planned quantities for excavation will be used as the measurement for payment for this item.
- 4.02 PAYMENT:
 - A. This item will be paid for at the contract unit price bid for "Excavation," as provided under the measurement method as included in the bid, which price shall be full compensation for all work herein specified: including dewatering, drainage, subgrade preparation, unless otherwise indicated and the furnishing of all materials, equipment, tools, labor and incidentals necessary to complete the work.
 - B. When not listed as a separate contract pay item, excavation 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 02270 - GRASS SEEDING FOR EROSION CONTROL

PART I - GENERAL

1.01 SECTION INCLUDES:

A. Items required for preparing ground, providing for sowing of seeds and fertilizing, mulching with straw, watering, weed control, and other management practices required for erosion control and to obtain a grass cover. Areas requiring seeding for erosion control will include the drainage ditch embankment and all areas disturbed by construction, including the working easement.

1.02 RELATED SECTIONS:

- A. Temporary erosion and sediment control during construction Section 02150.
- B. Site Preparation Section 02100.
- C. Earthwork Section 02200.

1.03 REFERENCES:

A. TXDOT - Texas Department of Transportation 1993 Standard Specifications for Construction of Highways and Streets and Bridges.

1.04 QUALITY ASSURANCE:

- A. Regulatory Requirements:
 - 1. Seed shall comply with U.S. Department of Agriculture rules and regulations under the Federal Seed Act.
 - 2. Bags of fertilizer shall be fully labeled complying with applicable State fertilizer laws and shall bear the name, trade name, trademark, warranty of producer, and analysis of contents.

3. Planting material shall conform to Texas Department of Transportation requirements for rural area species in sandy soils as shown in this Section.

- B. Contractors Qualifications:
 - 1. The work of this section shall be performed by a Contractor specializing in seeding and/or landscape installations.
 - 2. Guarantee all materials to be of quality and quantity as specified herein.
- C. Water For watering plantings, use water free of impurities injurious to plant growth.

1.05 SUBMITTALS:

- A. Certificates of Conformance or Compliance:
 - 1. Seed: Type, purity and germination rate analysis.
 - 2. Fertilizer Manufacture's, guaranteed analysis.
 - 3. Hydromulch fiber Manufacturer's guaranteed analysis.
 - 4. Tackifier Manufacture's guaranteed analysis.

1.06 PRODUCT HANDLING:

- A. Seed:
 - 1. Furnish seed in sealed standard containers.
 - 2. Seed which has become wet, moldy, or otherwise damaged in transit or in storage shall not be used.
 - 3. Wet moldy, or otherwise damaged seed will be rejected and removed from site.
- B. Fertilizer Deliver to site in sealed bags.

PART 2 - PRODUCTS

- 2.01 MATERIAL:
 - A. Seed: Refer to Planting Schedule this Section.
 - B. Fertilizer Complete fertilizer, for use with hydromulch, with minimum 50 percent nitrogen derived from organic sources. The dryweight percentage shall be 18-&12 (N-P-K), also containing zinc and iron.
 - C. Wood Cellulose Fiber Mulch:
 - 1. Specialty prepared wood cellulose fiber, for use with hydraulic application of grass seed

and fertilizer, processed to contain no growth or germination inhibiting factors, and dyed appropriate color to facilitate visual metering of application of materials. Green is

preferable.

- 2. Containing not in excess of 10 percent moisture, air dry weight basis.
- 3. Fibers become uniformly suspended in slurry tank mixture to form homogeneous slurry.
- D. Tackifier Provide a binding agent to hold mulch, fiber and seed in place. Tackifier shall

be water-soluble or shall be of remaining in suspension during the application process.

- 1. Source: Hydro-Tack, N-Tack, or Terra-Tack.
- E. Water Free from oil, acid, alkali, salt and other substances harmful to growth of grass.

PART 3 - EXECUTION

- 3.01 GENERAL:
 - A. Accomplish seeding and mulching work and seeding and fertilizing work within the planting periods specified in paragraph entitled "Planting Schedule' of this Section.
 - B. If factors prevail to such an extent that satisfactory results are not likely to be obtained, stop any phase of the work and resume work when desired results are likely to be obtained.
 - C. Conduct seeding and mulching operations across slope.
 - D. Accomplish seeding and mulching on all areas disturbed during construction. Including but not limited to excavated areas, fill areas, graded areas, drainage channels, outfall, berms and all borrow and stockpile areas.

3.02 INSPECTION AND TEST:

- A. Seed:
 - 1. Each lot of seed may be resampled and retested in compliance with latest rules and regulations under Federal Seed Act at discretion of Owner.
 - 2. Make resampling and retesting by or under supervision of Owner.
 - 3. If these tests reveal seed to be below specified pure live seed content, plant additional seed to compensate for deficiency at no additional cost to Owner.
 - 4. Seed retests: Conducted by approved laboratory.
 - 5. Make allowance for actual pure live seed content of specified grasses in determining actual planting rate.
- B. Fertilizers:
 - 1. Retain fertilizer bags and upon completion of project final check of total quantifies of fertilizer used will be made against total area treated.
 - 2. If minimum rates of application have not been met distribute additional quantities of

these materials to make up minimum application specified.

C. Mulch: At least five (5) days prior to commencement of mulching operations, notify Owner of sources from which mulch materials are available and quantities thereof.

3.03 SEED BED AND PREPARATION:

- A. General:
 - 1. Perform seeding after designated areas for seeding and fertilizing have been graded and smoothed to finished lines and grades and typical cross-sections.
 - 2. Equipment necessary for proper preparation of ground surface and for handling and placing required materials shall be on hand and in good condition before work is started.
- B. Grading:
 - 1. Maintain grades on areas to be seeded in true and even condition without ruts or tracks.
 - 2. Maintenance shall include any necessary repairs to previously graded area prior to planting of seed.
- C. Tillage:
 - 1. Accomplish in such manner as to prepare seed bed.
 - 2. Use tractors with adequate horsepower and heavy duty tillage equipment to accomplish specified tillage operations.
 - 3. Till areas with heavy duty disc, as necessary, followed by discing with disc harrow, and smoothing with weighted spike tooth harrow, railroad irons, or bridge Umber float

drag.

- 4. Cultivate seed bed so that soil particles on surface are small
- enough and lie close enough together to prevent seed from being covered too deep for
 - optimum germination.
- 5. Leave areas smooth for ease of mowing.
- 6. Depth of tillage: 4 inches.
- C. Cleanup:
 - 1. Prior to seeding, clear surface of stone, stumps, or other objects larger than 3 inches in

thickness or diameter and of roots, brush, wire, grade stakes, and other objects that might be a hindrance to maintenance operations.

2. Mow, rake and remove vegetation that may interfere with operations from site.

3.04 APPLICATION OF FERTILIZER:

A. Apply fertilizer simultaneously with seed and mulch in hydraulic equipment using specified rate of application.

3.05 PLANTING SEED:

- A. General:
 - 1. Conduct seeding equipment calibration tests as means of determining coverage per load to plant seed at specified rates.
 - 2. If unplanted skips are noted after germination and growth of grass, seed unplanted areas with grasses that were to have been planted at no additional cost to Owner.
- B. Seeding:
 - 1. Rate of application: Refer to Planting Schedule in this section.
 - Uniformly plant one-half of total amount of seed to depth of 1/4 inch to 1/2 inch by use of approved grain drills, native grass seed drills, Brillion Cultipacker seeder or equivalent, or by broadcasting seed and harrowing or raking lightly to cover seed.
 - 3. Spray on other one-half of total amount of seed with hydraulic equipment in combination with fertilizer and mulch.

3.06 APPLICATION OF MULCH:

- A. Area to be seeded shall first be cultipacked with Brillion Cultipacker or equivalent
- B. Make application of wood cellulose fiber mulch slurry with hydraulic equipment and accomplish immediately upon completion of final tillage.
- C. Hydraulically spray slurry on ground to form blotter-like ground cover uniformly impregnated with grass seed which, after application, will allow absorption of moisture and allow rainfall or mechanically applied watering to percolate to underlying soil.
- D. Apply wood cellulose fiber mulch at a rate of 50 pounds per 1000 square feet in combination with fertilizer at rate of 10 pounds per 1000 square feet and seed at rate prescribed in paragraph, "Planting Schedule" in this section. Repeat fertilizer (10 pounds per 1000 square feet) in 40 to 65 days.
- E. Use hydraulic equipment application of wood fiber mulch having built-in agitation system with operating capacity sufficient to agitate, suspend, and mix homogeneously slurry containing up to 40 pounds of fiber plus combined total of 70 pounds of fertilizer solids for each 100 gallons of water.
- F. Slurry Lines: large enough to prevent stoppage.

- G. Accomplish application of mulch slurry same day as completion of final tillage.
- H. Keep mulch moist by daily application of water, d necessary, for minimum of ten days or until seeds in mulch have germinated and rooted in soil.

3.07 MAINTENANCE OF TURF:

- A. General:
 - 1. Contractor is responsible for maintaining areas during planting period and until other work under contract has been completed.
 - 2. Maintenance shall consist of protection replanting, maintaining existing grades, and repair of erosion damage.
- B. Protection:
 - 1. Protect seeded and mulched areas against traffic or other use immediately after seeding is completed.
 - 2. Maintain protection of these areas until completion of work under contract
- C. Replanting:
 - 1. Prepare, reseed and remulch areas on which less than six live growing grass plants per square foot are present ten days after planting.
 - 3. Replant as specified for original planting.
 - 3. Perform replanting required without cost to Owner.
- D. Maintenance of Grades and Repair of Erosion Damage:
 - 1. Contractor is responsible for maintaining grades of slopes after commencement of planting operations and during maintenance period.
 - 2. Promptly repair any damage to finished surface grades.
 - 3. Promptly repair damage in the event erosion occurs from rainfall or other causes.
 - 4. Correct ruts, ridges, tracts, and other surface irregularities and replant areas where required prior to acceptance.

3.08 WATERING AND MAINTENANCE:

A. Apply water after compaction and seeding. Apply water using portable pipe or hose lines with rotating sprinklers within 24 hours after seeding. Sprinkling may be done with water trucks and hoses in certain locations where it is impractical to use portable lines or hoses. Supervise sprinkling to prevent runoff of water. The Contractor shall furnish all pumps, hoses, pipe lines, water trucks and sprinkling equipment required. Water with approved watering equipment in compliance with the schedule of 14,000 gal/acre weekly for 7 weeks, or as required to achieve grass coverage, whichever is greater. Do not water at rates exceeding 5,000 gal/acre/hr., to prevent runoff.

3.09 WEEDING:

- A. Keep all seeded areas relatively free from weeds and undesirable grasses, using approved methods, materials and timing.
- 3.10 DISEASE AND INSECT/PEST CONTROL:
 - A. Upon discovery of any disease or insect pest infestation identify or have identified the nature or species of infestation and submit the proposed method of control for approval prior to application of control measures.

3.11 MOWING:

A. Mow the grass should the height reach 3-1/2 inches or greater on the average before final acceptance. Mow to a height of 2-1/2 inches. Mow as required until work is accepted.

3.12 SEEDING:

- A. Minimum percentage by weight of pure live seed in each lot of seed shall be as follows: seed planted at rate per acre indicated under pure live seed required per acre. Note: Percent Pure Live Seed = Percent Purity times Percent Germination.
- B. Seed shall be treated with fungicide.
- C. Weed seed shall not exceed 10 percent by weight of total of pure live seed and other material in mixture.
- D. Johnson grass, ragweed, nutgrass or other noxious seed in mixture will be cause for rejection of seed.

IF PLANTING IS TO OCCUR

1 FEBRUARY THROUGH 1 SEPTEMBER

Тур	be of Seed	Minimum Percent Pure Live Seed Required	Pounds Pure Live Seed Required Per Acre
a.	Green Spangletop	85	0.6
b.	Sideoats Grama (Haskell or Premier)	85	1.8
c.	Buffalograss	85	5.3
d.	Little Bluestem	85	1.1
e.	KR Bluestem	85	0.7
f.	Switchgrass (Alamao)	85	1.2
		(Total a + b + c + d + e + f)	10.7

If Contractor begins construction outside the above stipulated allowable seeding dates, additional temporary seeding shall be performed. The temporary seeding shall be performed in addition to other seeding as herein specified. The temporary seeding shall be applied to all areas disturbed by construction per rates as specified below. All cost associated with the additional temporary seeding shall be considered subsidiary to Grass Seeding for Erosion Control.

ADDITIONAL TEMPORARY SEEDING

	Minimum Percent Pure	Pounds Pure Live
	Live Seed	Seed Required
Type of Seed	Required	Per Acre
a. Tall Fescue	85	4.0
b. Oats	85	21.0

(Total a + b): 25.0

END OF SECTION

SECTION 02514 - CONCRETE FLATWORK, CURBS, & APPROACHES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification sections apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Extent of portland cement concrete paving is shown on drawings including walks, curbs, and approaches.

1.03 QUALITY ASSURANCE

A. Codes and Standards: Comply with local governing regulations.

1.04 JOB CONDITIONS

- A. Traffic Control:
 - 1. Maintain access for vehicular and pedestrian traffic as required for other construction activities.
 - 2. Utilize barricades and warning signs as required.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
 - 1. Use flexible spring steel forms or laminated boards to form radius bends as required.
 - 2. Coat forms with a nonstaining form release agent that will not discolor or deface surface of concrete.
- B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A185. Furnish in flat sheets, not rolls, unless otherwise acceptable to Architect.
- C. Reinforcing Bars: Deformed steel bars ASTM A615, Grade 40.
- D. Fabricated Bar Mats: Welded or clip assembled steel bar or rod mats, ASTM A184. Use ASTM A615, Grade 40 steel bars, unless otherwise indicated.
- E. Joint Dowel Bars: Plain steel bars, ASTM A615, Grade 40. Cut bars true to length with ends square and free of burrs.
- F. Concrete Materials:

- 1. Portland Cement: ASTM C 150, Type I
 - a. Use one brand cement throughout project, unless otherwise acceptable to Architect.
- 2. Normal Weight Aggregates: ASTM C33, and as herein specified. Provide aggregates from a single source for exposed concrete.
 - a. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling causing deleterious substances.
 - b. Local aggregates not complying with ASTM C33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to Architect.
- G. Expansion Joint Materials: Contractor shall use pre-formed expansion joint fillers and sealers.
- H. Liquid Membrane Forming Curing Compound: Complying with ASTM C309, Type I, Class A unless other type acceptable to Architect. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.
 - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. "Masterseal", Master Builders
 - b. "Clear Seal", A.C. Horn
 - c. "Sure Cure", Kaufman Products, Inc.
 - d. "Sealkure", Toch Div. Carboline
 - e. "Kure-N-Seal", Sonneborn-Contech
 - f. "Sonocrete", Sonneborn-Contech
 - h. "L&M Cure", L&M Construction Chemicals
- I. Bonding Compound: Polyvinyl acetate or acrylic base, rewettable type.
 - 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. "Weldcrete", Larsen Products
 - b. "Everbond", L&M Construction Chemicals
 - c. "Hornweld", A.C. Horn
 - d. "Sonocrete", Sonneborn-Contech
 - e. "Acrylic Bondcrete", The Burke Co.

- A. Design mix to product normal weight concrete consisting of portland cement, aggregate, and water to produce the following properties.
 - 1. Compressive Strength: 3000 psi, minimum at 28 days, unless otherwise indicated.
 - 2. Slump Range: 5" for concrete containing HRWR admixture (superplasticizer); 3" for other concrete.
 - 3. Air Content: 5% to 8%.

PART 3 - EXECUTION

- 3.01 SURFACE PREPARATION
 - A. Remove loose material from compacted subbase surface immediately before placing concrete.
 - B. Proof roll prepared subbase surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

3.02 FORM CONSTRUCTION

- A. Set forms to required grades and lines rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least twenty four (24) hours after concrete placement.
- B. Check completed formwork for grade and alignment to following tolerances:
 - 1. Top of forms not more than 1/8" in 10'.
 - 2. Vertical face on longitudinal axis, not more than 1/4" in 10'.
- C. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.

3.03 REINFORCEMENT

- A. Locate, place, and support reinforcement as specified in this section unless otherwise indicated on plans.
- B. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as herein specified.
- C. Avoiding cutting or puncturing vapor retarder during reinforcement placement and concreting operations.
- D. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

- E. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Engineer.
- F. Place reinforcement to obtain at least minimum coverage's for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- G. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.04 CONCRETE PLACEMENT

- A. General: Comply with requirements of Division 3 sections for mixing and placing concrete and as herein specified.
 - 1. Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
 - Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
 - 3. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 4. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place a construction joint.
- B. Fabricated Bar Mats:
 - 1. Keep mats clean and free from excessive rust and handle units to keep them flat and free of distortions. Straighten bends, kinks, or other irregularities or replace units as required before placement. Set mats for a minimum 2" overlap to adjacent mats.
 - 2. Place concrete in 2 operations; strike-off initial pour for entire width of placement and to the required depth below finish surface. Lay fabricated bar mats immediately in final position. Place top layer of concrete, strike-off and screed.
 - a. Remove and replace portions of bottom layer of concrete which has been placed more than 15 minutes without being covered by top layer or use bonding agent if acceptable to Architect.

C. Curbs and Gutters: Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed minimums specified. Machine placement must produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

3.05 JOINTS

- A. General: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the center line unless otherwise indicated.
 - 1. When joining existing structures, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness as follows:
 - 1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
 - 2. Sawed Joints: (Contractor's Option) Form weakened-plane joints using powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.
- C. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for a period of more than 1/2 hour, except where such placements terminate at expansion joints.
 - 1. Construct joints as shown or, if not shown, use standard metal keywaysection forms.
 - 2. Where load transfer slip dowel devices are used, install so that one end of each dowel bar is free to move.
- D. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks, and other fixed objects, unless otherwise indicated.
 - 1. Locate expansion joints at 50' o.c. for each pavement lane, unless otherwise indicated.
 - 2. Extend joint fillers full width and depth of joint and not less than 1/2" or more than 1" below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.
 - 3. Furnish joint fillers in one piece lengths for full width being placed wherever possible where more than one length is required, lace or clip joint filler sections together.

- 4. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.
- E. Fillers and Sealants: Comply with requirements of applicable Division 7 sections for preparation of joints, materials, installation, and performance.

3.06 CONCRETE FINISHING

- A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.
- B. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities and refloat repaired areas to provide a continuous smooth finish.
- C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool and round to 1/2" radius unless otherwise indicated. Eliminate tool marks on concrete surface.
- D. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing as follows:
 - 1. Broom finish by drawing a fine hair broom across concrete surface perpendicular to the line of traffic. Repeat operation, if required, to provide a fine line texture acceptable to Architect.
 - 2. On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff bristled broom perpendicular to the line of traffic.
- E. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up any minor honeycombed areas. Remove and replace areas or sections with major defects as directed by Architect.

3.07 CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply in accordance with manufacturer's instructions after screeding and bull floating, but before power floating and troweling. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 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 moisture curing by one of the following methods.
 - 2. Keep concrete surface continuously wet by covering with water.

- 3. Use continuous water-fog spray.
- 4. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet.
- 5. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.
- 6. Provide moisture-cover curing as follows:
 - a. Cover concrete surfaces with moisture-retarding cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by water proof tape or adhesive.
 - b. Immediately repair any holes or tears during curing period using cover material and water proof tape.
 - c. Provide curing and sealing compound to exposed interior slabs and to exterior slabs, walks, and curbs as follows:
 - i. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen as disappeared).
 - ii. Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's directions.
 - iii. Recoat areas subjected to heavy rainfall within 3 hours after initial application.
 - iv. Maintain continuity of coating and repair damage during curing period.
 - v. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied to concrete.

3.08 REPAIRS AND PROTECTIONS

- A. Repair or replace broken or defective concrete as directed by Architect.
- B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

C. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

END OF SECTION

SECTION 02660 - WATER DISTRIBUTION SYSTEM

PART 1 GENERAL

1.1 **SCOPE**

- A. The Contractor shall furnish all labor, equipment, and materials and perform all operations necessary to construct a complete, functioning water distribution system.
- B. All materials and work performed shall be in accordance with plans, specifications, applicable codes and standards, and of first-class workmanship.

1.2 SAFETY PROVISIONS

- A. It shall be the responsibility of the Contractor to protect persons from injury and to avoid property damage.
- B. Contractor shall provide and maintain adequate barricades, construction signs, torches, red lanterns and guards during the progress of the construction work and until it is safe for traffic to drive over the trenches in the roadway.
- C. Contractor shall perform all construction in a safe manner, specifically, the rules and regulations of the Occupational Safety and Health Administration (OSHA) and the Manual of Uniform Traffic Control Devices (MUTCD).

1.3 REFERENCES

- A. City's Minimum Engineering and Construction Standards.
- B. Texas Building Codes.
- C. Texas Fire Prevention Code.
- D. Manual of Uniform Traffic Control Devices (MUTCD)
- E. NFPA 24
- F. ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings
- G. ASTM B88, Standard Specification for Seamless Copper Water Tube
- H. ASTM D1248, Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable
- I. ASTM D1599, Standard Test Method for Resistance to Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings
- J. ASTM D1785, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- K. ASTM D2241, Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
- L. ASTM D2737, Standard Specification for Polyethylene (PE) Plastic Tubing
- M. ANSI/AWWA C110, American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids International Restrictions
- N. ANSI/AWWA C500, AWWA Standard for Metal-Seated Gate Valves for Water Supply Service -International Restrictions
- O. ANSI/AWWA C600, Standard for Installation of Ductile-Iron Water Mains and their Appurtances - International Restrictions
- P. ANSI/AWWA C651, Disinfecting Water Mains International Restrictions
- Q. ANSI/AWWA C800, Underground Service Line Valves and Fittings International Restrictions
- R. ANSI/AWWA C900, Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution International Restrictions
- 1.4 EXISTING UTILITIES

- A. Contractor shall provide necessary temporary support, adequate protection and maintenance of all underground and surface utility structures, drains, sewers, and other obstructions encountered in the progress of the work at his own expense.
- B. Where existing utility structures such as conduits, ducts, pipe branch connections to main sewers, or main drains obstruct the grade or alignment of the pipe, the Contractor shall permanently support, relocate, remove, or reconstruct, the existing structure with the cooperation of the their owners.
 - 1. Do not deviate from the required line or grade except, as directed, in writing by the Architect.
- C. The Contractor shall obtain a Certification number and an existing utility field location at least 48 hours prior to beginning any excavation.
- D. Prior to beginning construction, the Contractor shall verify the size, location, elevation, and material of all existing utilities within the area of construction by use of record drawings, electronic locating devices, ground penetrating radar, potholing, or other suitable techniques.
- E. Existing utility locations shown on these plans are approximate and identified as either "to remain" or "to be removed".
 - 1. The Architect assumes no responsibility for the accuracy of existing utilities shown or for any existing utilities not shown.
- F. The Contractor is responsible for repairing any damage done during construction to any and all existing utilities.
- G. If upon excavation, an existing utility is found to be in conflict with the proposed construction or to be of a size or material different from that shown on the plans; the Contractor shall immediately notify the Architect.
- H. Provide water services to each building from the underground water main system, and not from adjacent buildings.
- 1.5 SHOP DRAWINGS AND SUBMITTALS
 - A. The Contractor shall provide the Architect a copy of all manufacturers' literature and data for materials installed under this section.
 - 1. The Architect shall review and stamp the submittals, "Approved" prior to installation by the Contractor.
 - B. Prior to final approval and acceptance of work, the Architect and other Regulatory Agencies shall review and accept the Contractors "As-Built" documentation.
 - 1. The Contractor shall provide complete and accurate "As-Built" information relative to manholes, valves, services, fittings, length of pipe, and the like, with the horizontal and vertical information verified by an independent Registered Surveyor to the Architect and other regulatory Agencies.
- 1.6 APPLICABLE CODES
 - A. General: All construction and materials shall conform to the Florida Building Code and all local and national codes where applicable.
 - B. Survey Data: All elevations on the plans or referenced in the specifications are based on National Geodetic Vertical Datum of 1929 (NGVD).
 - C. Portable water shall comply with the "City's Minimum Engineering and Construction Standards, Water and Sewer Systems," and/or the construction standards of any municipality having, jurisdiction.
- 1.7 RELATED DOCUMENTS

- A. The provisions of the General Conditions, Supplementary Conditions, and the Sections included under, Division 1, General Requirements, are included as part of this section.
- B. Section 02200 Earthwork.

PART 2 PRODUCTS

2.1 PIPE

- A. OFF-SITE
 - 1. For water main construction within the public right-of-way and utility easements refer to city, county, or state utility standards and specifications for water main construction within their right-of-way.
- B. ON-SITE
 - 1. The water main shall be either polyvinyl chloride (PVC) pipe or ductile iron pipe (DIP) and shall have push on rubber gasket joints.
 - Pressure pipe (4" and larger) PVC pipe shall be pressure pipe with iron o.d. class 150 (SDR 18) for domestic water and class 200 (SDR 14) for fire mains, conforming to AWWA C900.
 - 3. Ductile iron pipe (4" and larger) shall be cement-mortar lined and seal coated, class 150 for domestic water and class 200 for fire mains, mechanical, or push-on joints.
 - 4. Pressure pipe (under 4") Polyvinyl chloride (PVC) pressure pipe, schedule 40 conforming to ASTM D-1785 or SDR 21 conforming to ASTM D2241 with cement-solvent welded joints.
 - 5. Miscellaneous: ³/₄" threaded tie-rods shall be cadmium plated and painted with a coal tar base paint following installation.

2.2 FITTINGS

- A. Fittings for ductile iron and PVC pipes (4" and larger) shall have a pressure rating of 250 psi; use mechanical joints and conform to the latest revision of ANSI/AWWA C110.
- B. Mechanical joint fittings shall conform to the latest revision of ANSI/AWWA C110.
- C. Flanged fittings shall conform to ANSI Specifications for Class 125.
- D. Brass fittings shall conform to ANSI/AWWA C800, with all exposed threads covered with a protective plastic coating.
- E. Fittings for PVC pipe shall be cast iron mechanical joint type having a pressure rating of 250 psi and conforming to ANSI/AWWA C110.

2.3 VALVES

- A. Gate valves 2¹/₂" or less in size shall be standard 125 pound, non-rising stem, bronze, doubledisc, screwed type, equipped with hand wheel.
- B. Gate valves over 2¹/₂" shall be resilient seat gate valves with iron body, non-rising stem, fully coated disc with rubber seat ring manufactured in accordance with ANSI/AWWA C500.

2.4 VALVE BOXES

- A. Valve boxes shall be of standard extension design manufactured with top cover marked "water."
- B. The top section shall be adjustable for elevation and shall be set to allow equal movement above and below grade.
- C. Provide valve box appropriate in size for the required valve.
- D. Center the base of valve box over the valve and rest firmly on compacted backfill and the entire assembly shall be plumb.
- E. Valve boxes shall be like Figure H-10364, as manufactured by Mueller Company, or an approved equal.

2.5 HYDRANTS

- A. Hydrants shall have a minimum 6" mechanical joint base pipe connection, $5\frac{1}{4}$ " main valve opening, two $2\frac{1}{2}$ " hose nozzles, and one $4\frac{1}{2}$ " pumper nozzle.
 - 1. Threads shall be National Standard.
 - 2. Hydrants shall be cast iron body, fully bronze mounted, suitable for a working pressure of 150 pounds, and shall be in accordance with the latest specification of the ANSI/AWWA.
 - 3. They shall be of the O-ring seal type.
 - 4. Operation nut shall open counter-clockwise and be of the pentagonal shape, measuring 1½" from point to opposite flat.
- B. Provide hydrants with a breakaway feature that breaks cleanly upon impact.
 - 1. This shall consist of a two-part breakable safety flange with a breakable stem coupling.
 - 2. The upper and lower barrels shall be fluted and ribbed above and below the safety flange or have an extra strength lower barrel.
- C. Paint hydrants with one coat of zinc chromate primer and two finish coats of an approved paint of Architect approved color.
 - 1. Hydrants shall be Number A-423, Traffic type, as manufactured by Mueller Company, or an approved equal.

2.6 SERVICE CONNECTION AND METER

- A. The Contractor shall install or have the City install water meters complete with dual backflow preventer, valves and meter vault, at the locations shown on the drawings, and in accordance with the specifications as shown on the drawings.
- B. Contractor shall submit shop drawings for meter, valves, and backflow preventer.
- C. Contractor is responsible for all costs associated with providing and installing water meters, vaults, backflow preventers, valves, and connections in accordance with the applicable local utility or Palm Beach County Standards.
- 2.7 SERVICE METERS (3" Maximum)
 - A. Service water meters shall be of the rotating disc, bronze split case housing type.
 - B. The meter shall be of the straight reading type, recording flow in gallons, and shall be of the sealed register type.
 - C. Meters shall conform to applicable specifications of ANSI/AWWA and shall be as manufactured by Neptune Meter Company, or an approved equal.

2.8 METER BOXES

- A. Meter boxes shall be precast concrete with a two-piece reinforced concrete cover including a round concrete reading lid. All meter boxes must also meet local utility company requirements.
 - 1. Meter boxes for $\frac{5}{8}$ " or $\frac{3}{4}$ " meters shall be Model 36R, as manufactured by Brooks Products, Inc.
 - 2. Meter boxes for larger meters shall be of suitable size for the enclosed meter.
- B. Contractor shall submit shop drawings for meter boxes larger than ³/₄".

2.9 BACKFLOW PREVENTERS

A. Backflow preventers shall conform to AWWA Standard C506 and shall be of the "reduced pressure principle type".

- 1. The backflow preventer shall be provided as an assembly from one manufacturer. The assembly shall include two isolation valves, two check valves, and all other fittings or accessories needed to satisfy referenced design standards.
- B. Paint backflow preventers with one coat of zinc chromate primer and two finish coats of an approved paint of Architect approved color.
- C. Provide chain and padlock then chain and lock valves on all backflow preventers together.

2.10 PRESSURE GAGES

A. Pressure Gages: Pressure gages for line pressure measurement shall conform to Federal Specifications GG-G-76, Class 1, Style A, Type 1, 3¹/₂" diameter with phenolic case, or as indicated on the drawings.

2.11 CHECK VALVES

- A. Check valves shall be AWWA standard for 175-psi working pressure, swing type, iron body, or bronze mounted, leather faced disc, suitable for vertical or horizontal position.
- B. Valves shall be Mueller Figure A-2600 or approved equal.
- C. Where designated on the plans, check valves shall be spring loaded, double half disc wafer check valve, manufactured by TRW Mission, or approved equal.
- D. Spring shall be of sufficient tension so valve will close without appreciable slam.

2.12 WATER SERVICES

- A. Polyethylene Tubing Material shall comply with ASTM D1248 and the following:
 - 1. Polyethylene extrusion compound for extruding the polyethylene tubing shall comply with applicable requirements for PE-3406 or 3408 ultra high molecular weight polyethylene plastic material
 - 2. Tubing shall have a working pressure rating of 160 psi at 73.4°F.
 - 3. Tubing must be capable of maintaining pressure of 340 psi at 73.4°F for 1,000 hours when tested in accordance with ASTM D1599.
 - 4. Tubing surfaces shall be free from bumps and irregularities. Materials must be completely homogeneous and uniform in appearance.
 - 5. Tubing dimensions and tolerances shall correspond with the valves listed in ASTM D2737 with a standard dimension ratio (SDR) of 9.
 - 6. Provide label on tubing with brand name and manufacturer, NSF Seal, size, type of plastic material, and ASTM applicable designation with which the tubing complies.
- B. Copper tubing shall be type "K" and conform to AWWA Specification 75-CR and ASTM B88 with a working pressure rating of 160 psi at 73.4°F.
- C. Other service materials may be considered for specific installations, upon submissions of specification and approval by the Architect.
- D. Joints:
 - 1. Joints for polyethylene or copper tubing shall be of the compression type utilizing a totally confined grip seal and coupling nut.
 - a. Provide stainless steel tube stiffener insert for P.E. tubing service.
 - 2. Other type joints may be considered for specific installations, upon submissions of specifications and approval by the Architect.

2.13 METER VALVES

- A. Meter valves shall be of bronze construction in accordance with ASTM B62.
- B. Meter valves shall be closed bottom design and resilient "o" ring sealed against external leakage at the top.

- C. Provide a shut-off with a resilient pressure actuated seal so positioned in the plug as to completely enclose the flow way in the closed position.
- D. The inlet side of all meter valves shall have a compression type fitting as detailed in Section C Part 1.
- E. Meter valves for meter size 1" and under shall be equipped with a meter-coupling nut on the outlet sides.
- F. Meter valves for 11/2" and 2" meters shall have flanged connections on the outlet sides.
- G. Provide meter valves over 2" on individual basis for the particular installation.

2.14 CURB STOPS

- A. Curb stops shall be of the inverted key type with tee-head shut off.
- B. Curb stops shall be made of brass alloy in accordance with ASTM B62.

2.15 CORPORATION STOPS

- A. Provide corporation stops manufactured of brass alloy in accordance with ASTM B62.
- B. Inlet thread shall be taper thread in all sizes in accordance with ANSI/AWWA C800.
- C. Outlet connections shall have a compression type fitting as detailed in Section C Part 1.

2.16 TAPPING SLEEVES

- A. Ductile iron tapping sleeves shall be of the mechanical joint type having a flat-faced ductile iron flange, recessed for a tapping valve with all end and side gaskets totally confined.
- B. The contractor shall determine the outside diameter of the existing main before ordering the sleeve.

PART 3 EXECUTION

3.1 UNLOADING MATERIAL

- A. The Contractor shall exercise care in unloading and handling pipe, valves, fittings, and all other material.
- B. Do not drop pipe from trucks or allow pipe to roll against other pipe.

3.2 EXCAVATION

A. All excavation to conform to Section 02200.

3.3 SEPARATION OF WATER AND SEWER MAINS

A. See design plans for water and sewer separation statement and requirements.

3.4 WATER METER

- A. Domestic water service; provide a water meter (max. 3") and dual backflow preventer assembly. (Meter bypass with gate valve), (gate valve, meter, gate valve), (bypass reconnection), and (gate valve, backflow preventer, gate valve).
 - 1. All service pipes for 3" water meter shall be 4" ductile iron pipe with 4" gate valves with flanged fittings for above ground use, and mechanical fittings with retainer glands for underground use.
- B. Fire line system; provide a double detector check valve assembly and a fire department connection.

- 1. Provide gate valve, (¾" meter bypass with a gate valve and check valve).
- C. Locate both assemblies adjacent to property line, and provide either 6' high chain link fence around the assembly or chain lock the valves as indicated on the plans.

3.5 INSTALLATION OF PIPE

- A. Obtain permission of the Health Department, Water Department, and the Fire Department having jurisdiction, before installing water mains.
- B. All installation of pipe shall conform to AWWA C600.
 - 1. Do not roll or push pipe into the trench from the bank.
 - 2. Contractor shall thoroughly inspect all pipes before lowering into the trench, to insure its sound condition and eliminate the possibility of leakage or bursting under test pressure.
 - 3. Do not use pipes, valves, fittings or any other materials showing defects.
 - 4. Remove all such defective materials from the construction site immediately.
 - 5. Before lowering pipe into the trench, swab or brush it to insure that no dirt or foreign matter is in the finished line.
- C. Lay pipe on a flat bottom trench and backfill tamped to 6" above the top of the pipe.
 - 1. Pipe installation shall conform to "Type B Method" as adopted by Committee A21 of the American Standards Association.
 - 2. Provide a firm even bearing throughout the length of each section of pipe.
 - 3. Pipe shall not bear on any un-yielding structures, nor shall it support any other structures.
 - 4. Plug or cap all dead ends, anchor and hold in place with concrete backing as required.
 - 5. Except while work is in progress, plug all pipe openings to prevent entrance of water or any foreign matter.
 - 6. Remove material deemed unstable for providing adequate support for pipe and replace with a suitable material.
 - 7. Provide an adequate backfill material on the pipe to prevent floating, remove and relay any pipe that floats as directed by the Architect.
- D. Use one of the three following methods to connect new systems to existing mains:
 - 1. Method A that involves a reduced size temporary connection between the existing main and the new main.
 - 2. Method B that involves a direct connection between the new and existing mains using two gate valves separated by a sleeve with a vent pipe.
 - 3. Method C that involves a tap with one gate valve requiring disinfection of the new system prior to conducting the pressure test.
- E. The water utility company shall approve and witness the connection method.

3.6 JOINTS

- A. All joints shall be suitable for the type of pipe being jointed and shall be made in accordance with manufacturer's recommendations.
- B. Mechanical Joints:
 - 1. Mechanical joints shall be of the stuffing box type.
 - 2. Place the gland, followed by the rubber gasket over the plain end of the pipe inserted into the socket.
 - 3. Then push the gasket into position to evenly seat in the socket.
 - 4. Move the gland into position against the face of the socket, insert bolts and make finger tight.
 - 5. Using a ratchet wrench suitable to the pipe size, tighten bolts alternately bottom then top, etc., until the joint is complete.
- C. Compression Joints:

- 1. Compression joints shall be a rubber seal joint, made pressure tight by a molded rubber gasket and lubricant to facilitate assembly.
- 2. Make the joint tight by inserting the plain end into the bell after lubrication.
- 3. The compression joint shall be similar and equal to "Altite" b as manufactured by Alabama Pipe Company.
- 4. Follow the manufacturer recommendations in making up the joints.
- D. Flanged Joints:
 - 1. Use rubber gaskets to make flanged joints, with bolts having rough square hands and hexagonal nuts made to American Standard rough dimensions that are chamfered and trimmed.
 - 2. Bolts shall be the recommended size for the diameter of pipe being joined and be tightened to evenly distribute the stress in the bolts and bring the pipe in alignment.

3.7 INSTALLATION OF FITTINGS

- A. Applicable portions of these specifications shall apply to installation of fittings.
- B. Provide reaction or thrust blocking at bends and tees, and where changes in pipe diameter occur at reducers or in fittings.
- C. Refer to details for concrete strength and dimensions.
- D. Provide restrained joints for all fittings in the public right-of-way.

3.8 INSTALLATION OF FIRE HYDRANTS

- A. Applicable portions of these specifications shall apply to installation of fire hydrants.
- B. All hydrants shall stand plumb and burial line shall be set at finished grade.
- C. Place sufficient concrete thrust blocking as shown on the plans or as directed by the Architect.

3.9 INSTALLATION OF VALVES

- A. Applicable portions of these specifications shall apply to installation of valves.
 - 1. All valves shall stand plumb unless otherwise shown on the plans or directed by the Architect.
 - 2. The operation of installing tapping sleeves and an experienced contractor who has been engaged in this type of work not less than one-year with a representative list of successful installations shall install the valves.
- B. Provide appropriate shut-off in a valve box approximately 5' from the building on domestic water line to each building.

3.10 PRESSURE TESTS

- A. After adequately backfilling the pipe and at least seven days after placing the last concrete thrust blocking, pressure test all laid pipe for two hours at 150 psi minimum, in accordance with ANSI/AWWA C600-93.
- B. The pressure test shall not vary more than ± 5 psi during the test.
- C. Remove all air is from the pipe prior to pressure tests.
- D. The Contractor shall provide such means of venting the pipe as are required.
- E. The Contractor shall replace any material or installation proving defective.
- F. A representative of the City/County and the Architect shall witness the pressure test.

3.11 LEAKAGE TESTS

A. Bring the main up to test pressure, and hold at this pressure.

- 1. Carefully measure make-up water by use of a displacement meter or by pumping the water from a vessel of known volume.
- 2. Walk the length of the pipeline and inspect all joints for leakage and movement of pipe.
- 3. Repair all visible leaks.
- 4. Should any section of pipeline disclose joint leakage greater than that permitted, the Contractor shall, at his own expense, locate and repair the defective joints until leakage is within the permitted allowance.
- B. All pipe, etc. shall be tested under a constant pressure of 150 psi (fire main at 200 psi) for a minimum test of two hours and shall not exceed the leakage requirements as per ANSI/AWWA specifications of C600-93 leakage formula:
 - . 1. Q = <u>SD p5</u>
 - 133,200
 - Q = allowable leakage in gallons per hour
 - S = total length of pipe tested in feet
 - D = diameter of the pipe tested in inches
 - P = average test pressure in pounds per square inch

3.12 BACKFILL

- A. Backfill shall be in compliance with Section 02200 Earthwork.
- B. On completion of pressure and leakage tests, the exposed joints shall be backfilled to a depth of 12" above the top of the pipe.
 - 1. Backfill shall be carefully compacted until 12" of cover exists over the pipe.
 - 2. Place the remainder of the backfill and compacted thoroughly by puddling and tamping.
 - 3. When directed, the contractor may backfill the trench neatly rounded to a sufficient height allowing for settlement to grade after consolidation.

3.13 STERILIZATION OF COMPLETED PIPELINE

- A. Before final acceptance of completed pipeline, all requirements of the County and State Board of Health shall be satisfied.
 - 1. Forward satisfactory bacteriological test results from these agencies to the Architect.
- B. Prior to chlorination of mains, remove all dirt and foreign matter by high velocity flushing through fire hydrants or other approved blow-offs.
 - 1. Disinfect the main in accordance with the application sections of AWWA C651 and with local health department requirements.

3.14 RESTORATION OF SURFACES AND/OR STRUCTURES

- A. The Contractor shall restore and/or replace paving, curbing, sidewalks, fences, sod, survey points, or other disturbed surfaces or structures to a condition equal to that before the work was begun and to satisfaction of the Architect, and shall furnish all labor and materials incidental thereto.
- B. Restoration of surfaces and/or structures shall comply with all requirements of the applicable governing agencies including City, Town, County, and State.

3.15 CLEANING UP

- A. The Contractor shall remove surplus pipeline material, tools, temporary structures, etc., and as directed by the Architect, shall dispose of all dirt, rubbish, and excess earth.
- B. The construction site shall be left clean, to the satisfaction of the Architect

3.16 INSPECTIONS

A. The Contractor shall notify the City, Architect, and the Owner 24 hours prior to beginning construction to arrange the required inspection of the water system.

3.17 PROJECT RECORD DOCUMENTS

- A. The Contractor shall maintain accurate and complete records of work items completed.
- B. Prior to the placement of any asphalt or concrete pavement, the Contractor shall submit to the Architect, "as-built" plans showing water improvements.
 - 1. Paving operations shall not commence until the Architect has reviewed the "as-built."
- C. All "as-built" information submitted to the Architect shall be sufficiently accurate, clear and legible to satisfy the Architect that the information provides a true representation of the improvements constructed.
- D. Upon completion of construction, the Contractor shall submit to the Architect five complete sets of "as-built" construction drawings and one set of mylars.
 - 1. Clearly mark these drawings "as-built" show all construction changes and dimensioned locations and elevations of all improvements and signed by the Contractor.
 - 2. A Professional Land Surveyor registered in the State of Texas shall sign and seal the "As-Built drawings.
- E. "As-built" information on the water system shall include vertical and horizontal locations of all valves, fittings, fire hydrants, water services, and connection points.
 - 1. They shall show the associated pipe size and material type, and must also show the sample points and the sample point numbers must conform to the numbers used on the bacteriological test results.

3.18 FIRE PROTECTION SYSTEM.

- A. The domestic water system is separate loop from the fire protection system.
- B. Buildings with fire pumps; install the Fire Department connection pipe on the discharge side of the pump.
- C. Fire line extension from the main to the building, will be installed by a licensed fire sprinkler contractor. Test fire sprinkler pipe to 200 psi.
- D. All fire fighting equipment (fire department connection, hydrants, double detector check valve, and gate valves) to be more than 40' away from the building.
 1. Maintain 7' clearance around each fire hydrant.
- E. Provide flow and pressure test reports according to NFPA 24.
- F. All points on each building will be within 200' of an existing or proposed fire hydrant.
- G. Verify the fire protection water systems and hydrant locations are approved by the fire fighting authority having, jurisdiction.
- H. Multi-building campus; provide to each building or group of buildings a fire service pipe that contains a post indicator valve, backflow device, and a fire department connection, and a fire hydrant within 150'.
- I. Use ductile iron pipe for fire hydrant branches, fire main service (from the loop to the building), and fire department connections.

END OF SECTION

SECTION 02730 - SANITARY SEWERAGE UTILITIES

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. Sanitary sewer pipes & fittings.
- B. Excavation for pipe trenches.
- C. Manholes, covers, and grease traps.
- D. Requirements for documentation.

1.2 REFERENCES

- A. ANSI/AWWA C110, American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids
- B. ANSI/AWWA C151/A21.51, American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water
- C. ANSI/AWWA C900, Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution
- D. ANSI/AWWA C905, Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 In. through 36 In
- E. ASTM A48, Standard Specification for Gray Iron Castings
- F. ASTM C62, Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale
- G. ASTM D1782. Standard Test Method for Operating Performance of Particulate Cation-Exchane Materials
- H. ASTM D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
- I. ASTM D2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
- J. ASTM D3034, Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

1.3 EXISTING UTILITIES

- A. The contractor shall obtain a Certification number at least 48 hours prior to beginning any excavation.
- B. Prior to beginning construction, the Contractor shall verify the size, location, elevation, and material of all existing utilities within the area of construction by use of record drawings and/or electronic locating devices.
- C. Existing utility locations shown on the plans are approximate and based on available records.
 1. The Contractor is responsible for verifying all utilities, and notifying the Architect of conflicts and variations.
- D. The Contractor is responsible for damage to any existing utilities for which he fails to request locations from the utility owner, and for damage to existing utilities that are properly located.
- E. The Contractor shall immediately notify the Architect, if upon excavation finds the existing utility in conflict with the proposed construction or of a different size or material from that shown on the plans.
- 1.4 SHOP DRAWINGS AND SUBMITTALS
 - A. Submit under provisions of Section 01300.

- B. Prior to installation, the Contractor shall furnish to the Architect the manufacturers' literature and data for all materials installed under this section for his approval.
- $C. \quad \mbox{Complete As-Built information and plans required before final acceptance of the system.}$
 - 1. Contractor shall provide accurate record of complete system relative to manholes, cleanouts, services, fittings, pipe size, pipe material, pipe lengths, and the like.
 - Registered Surveyor shall provide all horizontal and vertical information in the Contractor's As-Built information.
 - 3. Final approval of the project "As-Built" information from the regulatory agencies having jurisdiction.
 - 4. Contractor shall camera the sewer lines and provide the District with a copy of the videotape.

1.5 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work in this section.
- B. Section 02200 Earthwork

1.6 APPLICABLE CODES

- A. General: All construction and materials shall conform to the Florida Building Code-Plumbing, all local and national codes where applicable.
- B. City's Water Utilities Department Minimum Engineering and Construction Standards.
- C. Construction Safety: Perform all construction in a safe manner; follow Occupational Safety and Health Administration (OSHA) and the Manual of Uniform Traffic Control Devices (MUTCD) regulations.
- D. Survey Data: All elevations on the plans or referenced in the specifications are based on National Geodetic Vertical Datum of 1929 (NGVD).

1.7 SANITARY SEWER SYSTEM

- A. Gravity sewer, lift station and force main shall comply with the Palm Beach County Water Utilities Department Minimum Engineering and Construction, Water and Sewer Systems, or the construction standards of the municipality having jurisdiction.
 - 1. Submit a copy of the Texas Department of Environmental Protection Permits.

PART 2 PRODUCTS

2.1 SEWER PIPE AND FITTINGS

- A. All sewer pipe and fittings shall be non-pressure polyvinyl chloride (PVC) pipe conforming to ASTM D3034, SDR 35, with push-on rubber gasket joints or ductile iron pipe with a ceramic epoxy lining and bituminous exterior coating.
- B. Gravity sewer pipes and force mains in wellfield zones #1 and #2.
 - 1. Contractor shall have permission from before working in a zone 1 wellfield.
 - 2. Ductile iron pipe ANSI/AWWA C151/A21.51; ceramic epoxy lined and bituminous exterior coatings.
 - 3. Polyvinyl chloride pipe, 4" and larger, ANSI/AWWA C900 and ANSI/AWWA C905, dimension ratio DR18.
- C. Fittings: PVC and DI pipe, over 4", use ductile iron mechanical joint fittings complying with AWWA/ANSI-C110and having coating/lining per B. Above.
 - 1. All fittings and accessories shall be as manufactured or supplied by the pipe manufacturer or approved equal.
- D. In addition to the above-cited specifications, all PVC sewers shall conform to the following additional requirements:
 - 1. The PVC sewer piping shall be of a product having a dimension ratio (DR) of 35 and minimum pipe stiffness (PS) of 46 psi.
 - 2. Joints: Use an integral bell gasket joint, designed so that when assembled, the elastomeric gasket inside the bell is compressed radically on the pipe spigot to form a positive seal.
 - a. The joint shall avoid displacement of the gasket when installed in accordance with the manufacturer's recommendation.
 - 3. Use manufacturer's recommended lubricants for joining of the pipes.
 - a. No solvent cement joints accepted.
 - b. Follow the pipe manufacturer's instructions for the joining of the pipe on the job, complete in the trench unless otherwise directed by the Architect.
 - 4. Gaskets: Mold all gaskets in a circular form or extruded to the proper section and then splice into circular form, and have a properly vulcanized high-grade elastomeric compound.
 - a. The basic polymer being natural rubber, synthetic elastomer or a blend of both.
 - b. The gaskets shall be of materials resistant to domestic sewage and as recommended by the manufacturer, with an adequate compressive force so as to affect a positive seal under all combinations of joint tolerance, as the gasket shall be the only element depended upon to make the joint flexible and watertight.
 - 5. Pipe and Fittings: The pipe shall be made of PVC plastic having a cell classification of 12454-B or 12454-C or 13364-B (with minimum tensile modulus of 500,000 psi) as defined in ASTM D1784.
 - a. The fittings shall be made of PVC plastic having a cell classification of 12454-B, 12454-C or 13343-C as defined in ASTM D1782.
 - b. Compounds that have different cell classifications because one or more properties are superior to those of the specified compounds are also acceptable.
 - c. Clean rework material generated by the manufacturer's own production may be used so long as the pipe or fittings produced meet all the requirements of the specification.
 - 6. The pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects.
 - a. The pipe shall be as uniform as commercially practical in color, capacity, density and other physical properties.
 - b. PVC pipe and fittings showing signs of ultra-violet degradation are not allowed.
 - 7. Pipe Marking: Clearly mark each standard and random length of pipe in accordance with the following example at intervals of 1.5 M (5') or less:
 - a. Manufacturer's Name or Trademark
 - b. Nominal Pipe Size
 - c. The PVC Cell Classification
 - d. The Legend Type e.g.- DR 35 PVC Sewer Pipe
 - e. Color: Green.
 - 8. Fittings Marking: The fittings in compliance with this standard shall be clearly marked per the following example:
 - a. Manufacturer's Name or Trademark
 - b. Nominal Pipe Size
 - c. The Material Designation PVC PSM
 - 9. Adapters: If field conditions require adapters, install per Architect's direction.
 - 10. Plugs: Service plugs shall be flexible virgin polyvinyl chloride as supplied by Fernco Joint Sealer Company.

PART 3 EXECUTION

3.1 INSTALLATION GENERAL

- A. The contractor shall provide for the furnishing of all labor, equipment, and materials to perform all operations necessary to construct and test the wastewater collection system in accordance with the plans and specifications.
- B. Obtain permission from the Health Department and utility company having jurisdiction before install the sewerage systems.
- C. Construct on site utilities in accordance with the City's Water Utilities Department Minimum Engineering and Construction Standards.
 - 1. Materials, installation, cleaning, testing, and disinfection.
- D. Waterproof interior of manholes, do not provide ladder rungs, and label covers.

3.2 EXCAVATIONS

- A. Keep trenches as nearly vertical as possible and if required, provide sheeting and bracing.
 1. Keep sheeting in place if in the opinion of the Architect or Contractor, damage could result from its removal.
- B. Except in rock, water-bearing earth, or where a granular or concrete base is used, stop mechanical excavation of trenches above the final grade elevation laying of pipe on a firm, undisturbed native earth bed.
 - 1. If over digging occurs, remove all loosened earth and bring the trench bottom back to grade with granular material.
- C. Carry excavations and trenches in rock to a depth of not less than 4" below the pipe bottom, and then fill with granular material or washed rock.
- D. Width of trenches shall be such as to provide adequate space for placing and jointing pipe properly, keep trench to a minimum width.
- E. Remove any unstable soil encountered and replace with gravel, crushed rock, or rock and sand suitably compacted.
- F. All excavations shall be in conformance with Section 02200, Earthwork.

3.3 DEWATERING

- A. The Contractor shall provide adequate equipment for the removal of storm or surface water that may accumulate in the excavation areas.
- B. If the contractor encounters subsurface water, he shall use an approved method to adequately dewater the excavation site so that it is suitably dry for working, form setting, concrete pouring, and pipe installation.
- C. This method shall be in place as necessary to maintain the excavation in a dry condition for such operations.
- D. All cost for this equipment and work shall be at the Contractor's expense.

3.4 PREPARATION OF TRENCH BOTTOM

- A. Do not allow water in the trenches during preparation of the trench bottom or during installation of pipe, unless authorized by the Architect.
- B. Shape a continuous trough to receive the bottom quadrant of the pipe barrel.
 - 1. Excavate bell holes so that after placement, only the barrel of the pipe receives bearing pressure from the trench bottom.
- C. Carefully prepare the trench bottom and place the pipe so that when in final position, the pipe is true to line and grade.
- D. When sand, crushed rock, gravel or pea rock are used to support the pipe, place such material in the trench bottom a minimum of 4" below the bottom of the pipe, and form the trough as described above to uniformly support the bottom quadrant of the pipe barrel.
- 3.5 INSTALLATION OF SEWER PIPE

- A. Install sewer pipe in accordance with ASTM D2321 and the Uni-Bell Plastic Pipe Association's Recommended Practice for the Installation of PVC Sewer Pipe.
- B. Protect pipe during handling against impact shocks and free falls.
 - 1. Keep pipe clean at all times and do not use pipe that does not conform to the specifications.
- C. Start laying the pipe at the lowest point, with spigot ends pointing in the direction of flow.
 - 1. Lay all pipes with ends abutting and true to line and grade.
 - 2. Carefully center pipe so that when laid, they will form a sewer with a uniform invert.
 - 3. Lay pipe in accordance with manufacturer's requirements as reviewed by the Architect.
- D. Lay pipe accurately to the line and grade as shown on the plans.
 - 1. Preparatory to making pipe joints, all surfaces of the portions of the pipe to be jointed or of the factory-made jointing material shall be clean and dry.
 - 2. Use lubricant, primers, adhesives, etc., as recommended by the pipe or joint manufacturer's specifications.
 - 3. The jointing materials or factory-fabricated joints shall be placed, fitted, joined and adjusted in such a manner as to obtain a watertight line.
 - 4. As soon as possible after making the joint, place sufficient backfill material along each side of the pipe to prevent movement of pipe off line and grade.
- E. Properly plug the exposed ends of pipe to prevent earth, water or other substances from entering the pipe when construction is not in progress.
- F. Properly grout the Harco or approved equal manhole couplings in place at each pipe connection into a manhole wall.

3.6 BACKFILLING TRENCHES

- A. Backfill all trenches and excavations immediately after laying pipe unless directed otherwise.
 - 1. Do not permit water to rise in open trenches after placement of pipe.
 - 2. Backfilling shall be in compliance with Section 02200.
- B. Backfill trenches with approved material free from large clods, stones or rocks larger than 1" in diameter, and carefully deposited in layers, not exceeding 6", until enough fill is placed to provide a cover of not less than 12" above the pipe.
 - 1. Place each layer, and then carefully and uniformly tamp, so as to eliminate the possibility of pipe displacement.
 - 2. Place the remainder of backfill material, moisten, and compacted, to 95% of AASHTO Specifications T-180 in landscaped areas and 98% of maximum density in paved areas.
- C. Refill, compact, smooth, and make to conform to surrounding grade any trenches improperly filled or settled.
- D. Unless otherwise directed, or shown on the plans, backfill in trenches in or through roadways shall be made as specified above, except that the entire fill above 1" over the pipe shall be deposited in layers not to exceed 12" thickness, moistened, and compacted to density equal to greater than that of adjacent material so that pavement can be placed immediately.

3.7 CONCRETE ENCASEMENT OF SEWER PIPE

- A. May use mechanical equipment to completely excavate trenches for pipe encasements.
- B. Prior to formation of the encasement, in at least two places provide temporary supports consisting of timber, wedges or masonry to support the pipe, one at the bottom of the barrel of the pipe adjacent to the shoulder of the socket, and the other near the spigot end.
- C. After the completion of jointing the pipe, uniformly pour concrete beneath and on both sides of the pipe.
 - 1. Use sufficient concrete so that encasement is at least 4" thick at all points.

3.8 MANHOLES

- A. Provide pre-cast concrete manholes with 4000-psi min compressive strength and grade-60 steel.
- B. May use other materials with prior approval of the Architect.
- C. Construct the manholes to ASTM C-478 requirements and the following:
 - 1. Minimum wall thickness shall be 8", and the inside diameter of base sections 48".
 - 2. Provide minimum 8" thick pre-cast reinforced base monolithically casted with the bottom section of manhole walls.
 - a. Extend the base slab a minimum of 4" from the outside of the manhole.
 - 3. Lifting holes through the structures are not permitted.
 - a. All holes shall be grout filled to a smooth surface.
 - 4. Minimum height of base sections shall be 3' from the bottom of base slab.
 - 5. Join manhole sections with a mastic compound or a round compression ring of neoprene material set in annular spaces cast into the spigot end of a bell spigot-type joint.
 - a. Uniformly compress the mastic compound or ring between the sections to form a watertight joint.
 - b. After the assembling the sections, point and fill the remaining space in the joint with a dense cement mortar and finish to a smooth, continuous surface inside and outside the wall sections.
 - 6. Pre-cast manhole cones, when used, shall terminate at such elevations as will permit laying up a minimum of two and maximum of four courses of clay brick under the manhole frame to make allowance for future street grade adjustment.
 - a. Approved HDPE adjusting rings may be used in-lieu of brick.
 - b. Mechanically attach HDPE rings to the marble frame and the cone.
 - c. Submit detail for approval prior to construction.
 - 7. Use dense, hard burned, common clay brick conforming to ASTM C62 latest revision for manhole construction, brick absorption shall be between 5 and 25 grams of water in one minute by dried brick, set flat face down, in ¹/₈" of water.
 - a. Thoroughly slush all brick with mortar at every corner.
 - 8. Construction of invert channels shall be:
 - a. Smooth and semicircular in shape conforming to inside of adjacent sewer section.
 - b. Changes in direction of flow shall be smooth curve of as large a radius as the size of the manhole will permit.
 - c. Changes in size and grade of channels shall be gradual and even.
 - d. Form invert channels by one of the following methods:
 - i) Directly into concrete manhole base, build up with block and mortar, lay half tile in concrete, or
 - ii) Lay full section of sewer pipe through manhole and cut out top half after the surrounding concrete has cured; cut shall be smooth and even.
 - e. Make the manhole floor outside of channels smooth, and slope toward channels at a slope of 1" per foot.
 - 9. Where shown on the drawings, the contractor shall place stub outs for future extensions, with a plug marked with a metallic locating device.
 - 10. Service laterals not permitted through manhole walls.
 - 11. Outside drop connections are required when the vertical distance between pipe inverts exceeds 2'.
 - a. Cast required drop connections monolithically with the manhole elements.
 - 12. Cover the entire inside of the manhole with two coats (8 mil each) of Koppers 300M Bitumastic Paint.
 - a. Remove all dirt, dust, oils, compounds and other foreign matter, and etch the surfaces with 18% to 20% muriatic acid solution.
 - b. Then thoroughly rinsed all surfaces with clean, clear water prior to paint application. Completely dilute the acid solution prior to removal from the system.
 - 13. Jointing and Plastering: Mortar for jointing and plastering shall consist of one part Portland cement and two parts of find sand.

- 14. Grout the influent and effluent sewers in place using a waterproof, expanding grout, acceptable to the Architect.
 - a. Seal all openings and joints watertight.
- 15. Make all castings for manhole frames and covers of clean even grain, tough gray cast iron.
 - a. The castings shall be smooth, true to pattern, and free from projects, sand holes, warp and other defects.
 - b. The horizontal surfaces of the frame cover seat and the under surface of the cover which rests upon the cover seat shall be machined.
 - c. The cover shall not rock after seating in any position of its associated frame.
 - d. Machining is required only on those frames and covers intended for vehicular traffic.
- 16. Coat castings with coal tar pitch varnish that shall make a smooth coating, tough and tenacious when cold, not tacky and not brittle.
 - a. Iron used for castings shall conform to ASTM A48 for Class 30, gray iron.
- 17. Cast the words "Sanitary Sewer", and the name of the Owner in the cover.
 - a. Set the manhole frames and covers so that the top cover is flush with the finished grade or as indicated on the drawings.
 - b. The manhole frame and cover type shall be as indicated on the drawings.
 - c. Frames will be suitable for the future addition of cast iron rings for upward adjustment of top elevation.
 - d. Machine the seating surfaces between frames and covers to fit true.
 - e. No plugging or filling is allowed.
 - f. Cast pick type lifting holes into lids, but do not go clear through the lid.
- 18. When a manhole is in low-lying areas or when in the opinion of the Architect an unusual condition exists, a sealed locking type lid may be required.
 - a. Installation of this type as directed by the Architect.
- 3.9 GREASE TRAPS/OIL SEPARATORS
 - A. Provide concrete grease trap tanks, 1250-gallon max per tank, with 2½" drop between tanks.
 - 1. Capacity = seats in dining room x part of day x loading factor.
 - 2. Internal concrete baffle is not required for multiple tanks.
 - B. Grease traps shall resist floatation at all times, even when empty.
 - C. In paved vehicle traffic areas, grease trap shall meet H-20 truck loading requirements.1. Place top slab reinforcing in the bottom of the slab, not the top.
 - D. Connect dumpster pad drain to the grease trap.
 - E. Place two-way cleanouts before, after, and between tanks.
 - F. Provide traffic covers and drop pipes as required.
 - G. Provide a neutralizing tank for acid waste pipes before draining into the sanitary system.
 - H. The effluent from the oil/water separator for vehicle wash down and garage areas shall drain into the sanitary sewer system.
 - 1. The tank shall be as manufactured by Highland Tank Co., Storytown, Pa. or approved equal.
 - 2. The tank shall be doubled wall with a 30-mil thick exterior coating.
 - 3. Have metallic risers with a corrosion-resistant coating, watertight manhole cover (fiberlite if over 36" dia.), and an electronic alarm panel installed inside the building.
 - 4. Contractor to provide the required dead-man anchors

$3.10\ \mathrm{CROSSING}\ \mathrm{OF}\ \mathrm{WATER}\ \mathrm{LINES}\ \mathrm{WITH}\ \mathrm{SEWERS}$

- A. Use ductile iron pipe in lieu of PVC pipes in the following conditions.
 - 1. When sewer line is less than 18" under a water line.
 - 2. When a sewer line is above a water line.
 - 3. The pipe is less than 4' from the top grade to the invert of the pipe.

4. When there is less than 10' of horizontal separation between the water and sewer pipes.

3.11 SEWER TEST

- A. On completion of each block or section of sewer, or such other times as the Architect may direct, the block or section of sewer is to be cleaned, tested and lamped.
 - 1. Each section of the sewer is to show on examination from either end, a full circle of light between manholes.
 - 2. Each manhole, or other appurtenance to the system, shall be of the specified size and form, to be watertight, neatly and substantially constructed, with the top set permanently to exact position and grade.
 - 3. All repairs shown necessary by the inspection are to be made; broken or cracked pipe replaced, all deposits removed, and the sewers left true to line and grade, entirely clean and ready for use.
 - 4. The Architect of Record and the City/County shall witness the sewer lamping.
- B. The allowable limits of infiltration or exfiltration for the system, or any portion thereof, shall not exceed a rate of 100 gallons per inch of inside pipe diameter per mile of pipe per 24 hours.
 - 1. No additional allowance allowed for house service lines.
 - 2. The allowable limits of infiltration or exfiltration of manholes shall not exceed a rate of four gallons per manhole per 24 hours.
 - 3. The Architect may direct testing of part or the entire system for infiltration or exfiltration.
 - 4. Prior to testing for infiltration, pump out the system so that normal infiltration conditions exist at the time of testing.
 - 5. The amounts of infiltration or exfiltration shall be determined by pumping into or out of calibrated drums, or other Architect approved methods.
- C. Conduct the exfiltration test by filling the portion of the system being tested with water to a level equal to the lowest part of the manhole frame.
 - 1. May substitute an air test for the water exfiltration test upon the Architect, District's Building Department, and the City's approval.
- D. Conduct tests on portions of the system not exceeding three manhole sections or 1000'; whichever is greater, unless directed by the Architect.
 - 1. Run tests continuously for 2 hours.
- E. Where infiltration or exfiltration exceeds the allowable limits specified herein, the Contractor shall locate and repair the defective pipe, joints, or other faulty construction.
 - 1. If the defective portions cannot be located, the Contractor shall remove and reconstruct as much of the work as is necessary in order to conform to the specified allowable limits.
 - 2. Repair all visible infiltration regardless of test results.
- F. The Contractor shall provide all labor, equipment and materials and shall conduct all testing required under the direction of the Architect.
 - 1. The Contractor shall include the cost of this work in the base bid.

3.12 INSPECTIONS

A. The Contractor shall notify the City and the Architect of Record at least 24 hours prior to beginning construction in order to arrange inspection of the sanitary sewer.

3.13 RESTORATION OF SURFACES AND/OR STRUCTURES

A. The Contractor shall restore and/or replace paving, curbing, sidewalks, fences, sod, survey points, or any other disturbed surfaces or structures to a condition equal to that before the work began and to the satisfaction of the Architect and shall furnish all labor and materials incidental thereto.

B. Restoration of surfaces and/or structures shall comply with all requirements of the applicable governing agencies.

3.14 PROJECT RECORD DOCUMENTS

- A. The Contractor shall maintain accurate and complete records of work items completed.
- B. All as-built information submitted to the Architect shall be sufficiently accurate, clear and legible to satisfy the Architect that the information provides a true representation of the improvements constructed.
- C. Upon completion of construction, the Contractor shall submit to the Architect one complete set of as-built construction drawings.
 - 1. These drawings shall be marked to show as-built construction changes and dimensional locations and elevations of all improvements and signed by the Contractor.
- D. A registered land surveyor shall certify all as-built information for water and sewer lines and submit in a format acceptable to all local reviewing agencies.
- E. Contractors shall camera the sewer lines and provide the District with a copy of the videotape.

END OF SECTION

SECTION 03300 - CONCRETE WORK

GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.

SUMMARY

Extent of concrete work is shown on drawings.

SUBMITTALS

Product Data: Submit data for non-proprietary materials and items, including admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by Architect.

Shop Drawings; Reinforcement: Submit original shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACT 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

QUALITY ASSURANCE

Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

ACT 301 "Specifications for Structural Concrete for Buildings".

ACT 318 "Building Code Requirements for Reinforced Concrete".

Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice".

Materials and installed work may require testing and retesting at anytime during progress of work. Retesting of rejected materials for installed work, shall be done at Contractor's expense.

PROJECT CONDITIONS

Protect adjacent finish materials against spatter during concrete placement.

PRODUCTS

FORM MATERIALS

Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

Provide ties which, when removed, will leave holes not larger than 1" diameter in concrete surface.

REINFORCING MATERIALS

Reinforcing Bars: ASTM A 615, Grade 60 deformed.

Steel Wire: ASTM A 82, plain, cold-drawn steel.

Welded Wire Fabric: ASTM A 185, welded steel wire fabric.

Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications.

For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs. Brick scrap is acceptable.

CONCRETE MATERIALS

Portland Cement: ASTM C 150, Type I, "Alamo Cement" or equal. Use one brand of cement throughout project, unless otherwise acceptable to Architect.

Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.

For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.

Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to Architect.

Water: Drinkable.

Water-reducing Admixture: ASTM C 194, Type A, and containing not more than 0.1 percent chloride ions.

Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

"WRDA Hycol"; W.R. Grace. "PSI N"; Gifford-Hill/American Admixtures "Eucon WR-75"; Euclid Chemical Co. "Pozzolith Normal"; Master Builders. "Plastocrete 160"; Sika Chemical Corp. "Chemtard"; Chem-Masters Corp. "Pro-Kete-N"; Protex Industries, Inc.

Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C 494, Type E, and containing not more than 0.1 percent chloride ions.

Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

"Accelguard 80"; Euclid Chemical Co. "Pozzolith High Early"; Master Builders. "Gilco Accelerator"; Gifford-Hill/America Admixtures

Water-Reducing, Retarding Admixture: ASTM C 494, Type D, and containing not more than 0.1 percent chloride ions.

Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

"Edoco 20006"; Edoco Technical Products. "Pozzolith Retarder"; Master Builders. "Eucon Retarder 75"; Euclid Chemical Co. "Daratard"; W.R. Grace. "PSI R"; Gifford-Hill/American Admixtures. "Plastiment"; Sika Chemical Co. "Protard"; Protex Industries, Inc.

Prohibited Admixtures: Calcium chloride thyocyanates or admixtures containing more than 0.1 percent chlorine ions are not permitted.

RELATED MATERIALS

Vapor Retarder: Provide vapor retarder cover over prepared base material where indicated below slabs on grade. Use only materials which are resistant to decay when tested in accordance with ASTM E 154, as follows:

Polyethylene sheet not less than 10 mils thick.

Liquid Membrane-Forming Curing Compound: Liquid type membrane-forming curing compound complying with ASTM C 309. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq ft./gal.

Products: Provide the following:

"Sonosil': Sonneborn.

Bonding Compound: Polyvinyl acetate or acrylic base.

Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

Polyvinyl Acetate (Interior Only):

"Euco Weld"; Euclid Chemical Co. "Weldcrete"; Larsen Products Corp.

Acrylic or Styrene Butadiene:

"J-40 Bonding Agent"; Dayton Superior Corp. "Everbond"; L & M Construction Chemicals. "Hornweld': A.C. Horn, Inc. "Sonocrete"; Sonneborn-Rexnord. "Acrylic Bondcrete"; The Burke Co. "SBR Latex"; Euclid Chemical Co. "Daraweld C"; W.R. Grace

PROPORTIONING AND DESIGN OF MIXES:

Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACT 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.

Submit written reports to Architect and Structural Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.

Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

3000 psi 28-day compressive strength; W/C ratio, 0.58 maximum (non-airentrained), 0.46 maximum (air-entrained). For structural slabs.

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 Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

Admixtures:

Use water-reducing admixture in concrete as required for placement and workability.

Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F (10 deg C).

Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

Ramps, slabs, and sloping surfaces: Not more than 5".

Reinforced foundation systems: Not less than 3" and not more than 5".

Other concrete: Not less than 3" nor more than 5".

CONCRETE WORK 03310 5

CONCRETE MIXING

Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.

During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

EXECUTION

GENERAL:

Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

FORMS:

Design, erect, support, brace, and maintain formwork to support vertical and lateral, static and dynamic loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACT 347.

Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.

Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorage insets, and other features required in work. Use selected materials to obtain required finishes. Solidly but joints and provide back-up at joints to prevent leakage of cement paste.

Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

Provide temporary openings where interior of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

Provisions for Other Trades: Provide openings is concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retightening forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

VAPOR RETARDER INSTALLATION

Following leveling, tamping, and termite treatment of granular base for slabs on grade, place vapor retarder sheeting with longest dimension parallel with direction of pour.

Lap joints 6" and seal with appropriate tape.

PLACING REINFORCEMENT

Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

Avoid cutting or puncturing vapor retarder during reinforcement placement and concreting operations.

Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

JOINTS:

Construction Joints: Locate and install construction joints as indicated or, if not indicated, located so as not to impair strength and appearance of the structure, as acceptable to Architect.

Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints, except as otherwise indicated.

INSTALLATION OF EMBEDDED ITEMS

General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

PREPARATION OF FORM SURFACES

Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.

Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

Thin form-coating compounds only with thinning agent of type, amount, and under conditions of formcoating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

Coat steel forms with, if used, a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

CONCRETE PLACEMENT

Replacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or casting. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

Apply temporary protective covering to lower 2' of finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during placement.

General: Comply with ACT 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.

Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACT 309.

Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly space locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

Bring slab surfaces to correct level within straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

Maintain reinforcing in proper position during concrete placement operations.

Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACT 306 and as herein specified.

When air temperature has fallen to or is expected to fall below 40 deg F (4deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C), and not more than 80 deg F (27 deg C) at point of placement.

Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix design.

Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACT 305 and as herein specified.

Cool ingredients before mixing to maintain concrete temperature at time of placement below 95° deg F (32 deg C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.

Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.

Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

FINISH OF FORMED SURFACES

Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with the holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.

MONOLITHIC SLAB FINISHES:

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.

After placing slabs, plane surface to tolerances for floor flatness (F) of 25 and floor levelness (F1) of 20. Slope surfaces uniformly to drains where requires. After leveling, roughen surface before final set, with stiff brushes, brooms, or rakes.

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, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

After screeding, 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. Check and level surface plane to tolerances of F 18 - F 15. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

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 firm finish coating system.

After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface procedures a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of F 20 - F 25. Grind smooth surface defects which would telegraph through applied floor covering system.

Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristly broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

CONCRETE CURING AND PROTECTION

General: Protect freshly placed concrete from premature drying and excessive cold or hot temperature.

Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.

Provide curing and sealing compound to exposed interior slabs and to exterior slabs, walks, and curbs, as follows:

Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in

accordance with manufacturer's directions. Recoat areas subjected to heave rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.

Sealer and Dustproofer: Apply a second coat of specified curing and sealing compound only to surfaces given a first coat.

REMOVAL OF FORMS

Formwork not supporting weight of concrete, such as sides of beams and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

RE-USE OF FORMS

Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

MISCELLANEOUS CONCRETE ITEMS

Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

CONCRETE SURFACE REPAIRS:

Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.

Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

For exposed-to-view surfaces blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

Repair of Formed Surfaces: Removed and replaced concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.

Correct high area in unformed surfaces by grinding, after concrete has cured at least 4 days.

Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.

Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2-1/2" parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

Perform structural repairs with prior approval of Architect or Structural Engineer for method and procedure, using specified epoxy adhesive and mortar.

Repair methods not specified above may be used, subject to acceptance of Architect.

QUALITY CONTROL TESTING DURING CONSTRUCTION

The Contractor will employ a testing laboratory to perform test and to submit test reports.

Sampling and testing for quality control during placement of concrete shall include the following, as directed by Architect.

Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.

Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each day's pour of each type of airentrained concrete.

Concrete Temperature: Test hourly when air temperature is 40 deg F (4 deg C) and below, and when 80 deg F (27 deg C) and above; and each time a set of compression test specimens are required.

Compression Test Specimen: ASTM C 31, one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

Compressive Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu yds. plus additional sets for each 50 cu yds. over and above the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required. When frequency of testing will provide less than 5 strength test for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

Test results will be reported in writing to Architect, Structural Engineer, and Contractor within 24 hours after tests. Reports of compressive strength test shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

See Structural Plans for additional requirements.

END OF SECTION 03300

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

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. All concrete work, including sidewalks, exterior ramps, steps, miscellaneous concrete.
- B. All form work.
- C. Reinforcing steel.
- D. Installation of sleeves which are furnished by plumbing, heating and electrical contractors.
- E. Equipment bases are shown on architectural, mechanical, plumbing and electrical drawings.
- F. Provide and install water stop material at below grade joints.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Testing Laboratory services.
- B. Excavation and fill.
- C. Concrete paving, curbs, sidewalks and site concrete.
- 1.4 DRAWING REFERENCES: See drawings for reinforcing sizes and placement.
- 1.5 Submittals:
 - A. DESIGN MIX: Submit six (6) copies directly to the project Architect the proposed concrete mix(es). Include cement brand and type, aggregate identification, admixtures, proportions and anticipated strengths.

- B. PLASTIC CHAIR SUPPORTS: Submit manufacturer's literature indicating dimensions, configurations and performance data. Submit sample for approval by the Architect. Space at a maximum of 45" centers each way. Provide closer spacing where required to prevent excessive sag, where indicated on the drawings, or to support the weight of concrete pump hose.
- C. ADMIXTURES: Submit manufacturer's product data describing material and mix proportions.
- D. WATERSTOPS: Submit manufacturer's product data describing material and installation procedures.
- E. CURING COMPOUND: Submit Manufacturer's literature indicating composition and recommended application procedures.
- F. Reference Section 01 33 00 SUBMITTALS for additional submittal requirements.

1.6 SAMPLES

A. Plastic chair support.

1.7 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.

1.8 QUALITY ASSURANCE

- A. Cast-in-place concrete shall be installed by technicians specially trained in the proper handling, placing and protection of concrete and reinforcing steel. If required by the Architect, installer shall submit for approval a list of similar installations successfully completed.
- B. Comply with ASTM C 94; ACI 301, "Specification for Structural Concrete"; ACI 117, "Specifications for Tolerances for Concrete Construction and Materials"; and CRSI's "Manual of Standard Practice."
- C. Engage a qualified independent testing agency to design concrete mixes.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. GENERAL: All materials used in the Work shall be stored or handled in a manner that will prevent deterioration; any materials that have been damaged shall be immediately and completely removed from the Work. All manufactured materials, such as cement, shall be delivered and stored in their original packages that show marks or other evidence of damage shall be wholly rejected.
- B. Deformed Reinforcing Bars: ASTM A 615/A 615M, Grade 60.
- C. Plain Steel Wire: ASTM A 82, as drawn.
- D. Steel Welded-Wire Fabric: ASTM A 185, flat sheets not rolls. Use mesh for sidewalks and equipment pads, as indicated on the drawings.

- E. Portland Cement: ASTM C 150, Type I, latest edition.
- F. The use of Fly Ash in the concrete mix is not acceptable.
- G. Aggregates: ASTM C 33, uniformly graded.
- H. Fiber Reinforcement: ASTM C 1116, Type III, synthetic fibers, 1/2 to 1 inch.
- I. Air-Entraining Admixture: ASTM C 260.
- J. Chemical Admixtures:
 - 1. General: All admixtures shall be added only at the plant during mixing and must be prior approved by the Testing Laboratory. Admixtures shall comply with the requirements of ASTM C260 and C-494. Admixtures containing calcium chloride are not acceptable. Do not use admixtures in footings or seal slabs.
- K. Water Stops: Flat dumbbell or center-bulb type, of either rubber (CRD C 513) or PVC (CRD C 572).

L. Vapor Barrier: Reference Spec Section 07 26 16 Under Slab Vapor Barrier.

- M. Liquid Membrane-Forming Curing Compound: ASTM C 309, clear, Type I, Class A or B, solvent borne, wax free.
- N. Liquid Membrane-Forming Curing and Sealing Compound: ASTM C 1315, clear, Type I, Class A, solvent borne.
- O. Slip-Resistive Aggregate: Factory-produced, rustproof, nonglazing, fused aluminum-oxide granules or crushed emery, unaffected by freezing, moisture, and cleaning materials.
- P. Joint-Filler Strips: ASTM D 1751, cellulosic fiber, or ASTM D 1752, cork.
- Q. Repair Underlayment: Factory-packaged, portland or blended hydraulic cement-based, polymermodified, self-leveling underlayment with minimum 28-day compressive strength of 4100 psi (29 MPa).
- R. Repair Topping: Factory-packaged, portland or blended hydraulic cement-based, polymer-modified, self-leveling traffic-bearing topping with minimum 28-day compressive strength of 5700 psi (39 MPa).

2.2 MIXES

- A. Proportion normal-weight concrete mixes to provide the following properties:
 - 1. Compressive Strength:
 - a. Ramps and sidewalks: 3000 psi at 28 days.
 - 2. Slump Limit: 5 inches at point of placement.
 - 3. Air Content: 5.5 to 7.0 percent for concrete exposed to freezing and thawing, 2 to 4 percent elsewhere.

2.3 FORMWORK

A. GENERAL: Forms shall conform to the shapes, lines, grade and dimensions of the concrete as indicated in the drawings. Lumber used in forms for exposed surfaces shall be dressed to a uniform thickness and shall be free of loose knots or other defects. Lumber once used in forms shall be thoroughly cleaned before another usage. Form **full depth** of outside face of perimeter grade beams without horizontal joints or cracks. Forms shall be substantial and sufficiently tight to prevent leakage. They shall be properly shored, braced or otherwise tied or supported to maintain the desired position and shape during and after placement of concrete. Use no formwork which may stain exposed concrete surfaces.

- B. FORM LINING: For exposed concrete the final finish shall be smooth, even and free of defects.
- C. FORM REMOVAL: Forms shall remain in place sufficient time for the concrete to obtain necessary strength to support its own weight and construction load.

PART 3 - EXECUTION

3.1 CONCRETING

- A. Construct formwork and maintain tolerances and surface irregularities within ACI 117 limits of Class A for concrete exposed to view and Class C for other concrete surfaces.
- B. Set water stops where indicated to ensure joint water tightness.
- C. Place vapor retarder on prepared subgrade, with joints lapped 6 inches (150 mm) and sealed.
- D. Accurately position, support, and secure reinforcement.
- E. Install construction, isolation, and contraction joints where indicated. Install full-depth joint-filler strips at isolation joints.
- F. Place concrete in a continuous operation and consolidate using mechanical vibrating equipment.
- G. Protect concrete from physical damage, premature drying, and reduced strength due to hot or cold weather during mixing, placing, and curing.
- H. Formed Surface Finish: Smooth-formed finish for concrete exposed to view, coated, or covered by waterproofing or other direct-applied material; rough-formed finish elsewhere.
- I. Slab Finishes: Float finish for ramps and surfaces to receive waterproofing or other direct-applied material. Trowel and fine-broom finish for surfaces to receive thin-set tile. Nonslip-broom finish to exterior concrete platforms, steps, and ramps.
- J. Uniformly spread 25 lb/100 sq. ft. (12 kg/10 sq. m) of dampened slip-resistive aggregate over initially floated surfaces; tamp and float. Expose nonslip aggregate after curing.
- K. Uniformly spread 100 lb/100 sq. ft. (49 kg/10 sq. m) of mineral dry-shake floor hardener over initially floated surfaces, repeat float finishing to embed each application, and then apply a trowel finish.
- L. Cure formed surfaces by moist curing for at least seven days.
- M. Begin curing concrete slabs after finishing.
- N. Owner will engage a testing agency to perform field tests and to submit test reports.
- O. Protect concrete from damage. Repair surface defects in formed concrete and slabs.
- P. Repair slabs not meeting surface tolerances by grinding high areas and by applying a repair underlayment to low areas receiving floor coverings and a repair topping to low areas to remain exposed.

3.2 CLEANING AND PROTECTION

- A. CLEANING: Slabs are to be kept free of any foreign substances (wax, oil, paint, etc.) or surface irregularities that may affect the final appearance of the completed installation.
- B. Unless otherwise approved by the Architect, no vehicular traffic will be allowed on any concrete until after the 7 day concrete tests have been made by the laboratory indicating that the concrete has attained 3,000 psi compressive strength.
- C. Contractor shall coordinate with Architect and Owner to determine a suitable on-site "wash-out" area for concrete trucks. Contractor shall be responsible for clean-up of the area.
- D. Contractor shall keep clean all adjacent public streets and rights of way. Wash down daily or more often as needed to remove mud and maintain a safe condition at entrances/exits to job site.

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 Starb. 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, ¹/₂ 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. Re-temper 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 Heckman Build Products, Inc. Masonry Reinforcing Corp. of America

AA Wire Products Company Hohmann and Barnard, Inc. 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:

- 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. Bullnose edge at all masonry corners for interior walls.

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 reinforcing 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 ¹/₂" 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 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, 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 ³/₄" 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 wallsupported 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.

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. Fiberglass roll or batt insulation
- 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.

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-testresponse 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 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
- B. Batt or Roll Insulation:
 - 1. Johns Manville
 - 2. Owens Corning
 - 3. Certainteed

<u>General:</u> Insulation shall be fine fiber, flexible, resilient glass fiber blanket. Moisture absorption shall be less than .2% by volume.

1. Above Fiber Cement Board (Ceilings): 10" x 16" wide x 96" thermal batt insulation kraft faced fiberglass. "R" factor 30

AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

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 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.

SECTION 07 21 19 - FOAMED-IN-PLACE MASONRY WALL INSULATION

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 SUMMARY

- A. Extent of insulation work is shown on drawings and indicated by provisions of this section.
- B. Applications of insulation specified in this section include the following:
 1. Foamed-In-Place masonry insulation for thermal, sound and fire resistance values.

1.02 SUBMITTALS

- A. Product and technical presentation as provided by the manufacturer.
- B. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including R-values, fire performance and sound abatement characteristics.
- C. Material Safety Data Sheet: Submit Material Safety Data Sheet complying with OSHA Hazard Communication Standard, 29 CRF 1910 1200.

1.03 QUALITY ASSURANCE

- A. Manufacturing Standards: Provide insulation produced by a single and approved manufacturer. The product must come from the manufacturer pre-mixed to ensure consistency.
- B. Installer Qualifications for Foamed-In-Place Masonry Insulation: Engage an experienced dealer/applicator who has been trained and licensed by the product manufacturer and which has not less than three years direct experience in the installation of the product used.
- C. Warranty: Upon request, a one year product and installation warranty will be issued by both the manufacturer and installer.

D. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by a testing agency acceptable to authorities having jurisdiction.

Product must be classified by Underwriters Laboratory ® ("UL") as to Surface Burning Characteristics

Fire Resistance Ratings:	ASTM E-119
Surface Burning Characteristics:	ASTM E-84
Combustion Characteristics:	ASTM E-136

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturers of Foamed-In-Place Masonry Insulation: Subject to compliance with requirements, provide products from the following:
 - a. "Core-Fill 500[™]"; Tailored Chemical Products, P.O. Drawer 4186, Hickory, N.C. 28603, (800) 627-1687
 - b. Or approved equal.

2.02 INSULATING MATERIALS

- A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.
- B. Foamed-In-Place Masonry Insulation: Two component thermal insulation produced by combining a plastic resin and catalyst foaming agent surfactant which, when properly ratioed and mixed, together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow unit masonry walls.
 - 1. Fire-Resistance Ratings: Minimum four (4) hour fire resistance wall rating (ASTM E-119) for 8" and 12" concrete masonry units when used in standard two (2) hour rated CMUs.
 - 2. Surface Burning Characteristics: Maximum flame spread, smoke developed and fuel contributed of 0, 5 and 0 respectively.
 - 3. Combustion Characteristics: Must be noncombustible, Class A building material.
 - 4. Thermal Values: "R" Value of 4.91/inch @ 32 degrees F mean; ASTM C-177.
 - 5. Sound Abatement: Minimum Sound Transmission Class ("STC") rating of 53 and a minimum Outdoor Indoor Transmission Class ("OITC") rating of 44 for 8" wall assembly (ASTM E 90-90).

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

A. Application Assemblies: Block Walls: 6 Cavity Walls: 2

6", 8", 10" or 12" concrete masonry units 2" cavity or greater

3.02 INSTALLATION OF FOAMED-IN-PLACE INSULATION

- A. General: Install foamed-in-place insulation from interior, or as specified, prior to installation of interior finish work and after all masonry and structural concrete work is in place; comply with manufacturer's instructions.
- B. Installation: Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam insulation shall be pressure injected through a series of 5/8" to 7/8" holes drilled into every vertical column of block cells (every 8" on center) beginning at an approximate height of four (4) feet from finished floor level. Repeat this procedure at an approximate height of ten (10) feet above the first horizontal row of holes (or as needed) until the void is completely filled. Patch holes with mortar and score to resemble existing surface.

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/(ft² · 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 <u>www.stegoindustries.com</u>.
- B. Penetrations of Vapor barrier:
 - 1. Stego Mastic by Stego Industries LLC, (877) 464-7834 <u>www.stegoindustries.com</u>.
 - 2. Stego Tape by Stego Industries LLC, (877) 464-7834 <u>www.stegoindustries.com</u>.
- C. Perimeter/edge seal:
 - 1. Stego Crete Claw by Stego Industries LLC, (887) 464-7834 <u>www.stegoindustries.com</u>.
 - 2. Stego Term Bar by Stego Industries LLC, (877) 464-7834 <u>www.stegoindustries.com</u>.
 - 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.

SECTION 07 31 13 - ASPHALT SHINGLES

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. Asphalt roofing shingles.
- B. Leak barrier and moisture shedding roof deck protection.
- C. Metal flashing associated with shingle roofing.
- D. Attic ventilation.

1.3 RELATED SECTIONS

- A. Section 06 10 00 Rough Carpentry: Framing, wood decking and roof sheathing.
- B. Section 07 62 00 Flashing and Sheet Metal: Sheet metal flashing not associated with shingle roofing; gutters and downspouts.

1.4 REFERENCES

- A. ASTM A 653/A 653M Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM B 209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. ASTM B 370 Standard Specification for Copper Sheet and Strip for Building Construction.
- D. ASTM D 3462 Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
- E. UL 790 Tests for Fire Resistance of Roof Covering Materials.
- F. UL 997 Wind Resistance of Prepared Roof Covering Materials.

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, showing compliance with requirements.
- C. Selection Samples: Two complete sets of color cards representing manufacturer's full range of available colors and patterns.
- D. Manufacturer's installation instructions, showing required preparation and installation procedures.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the roofing system products specified in this section, with minimum of 25 years experience.
- B. Pre-Installation Meeting: Conduct a pre-installation meeting not more than 2 weeks after the start of the roofing project and before start of roofing installation.
 - 1. Contractor shall schedule and arrange meeting and meeting place and notify attendees.
 - 2. Mandatory Attendees: Roofing installer and manufacturer's steep slope technical representative (not sales agent).
 - 3. Optional Attendees: Owner's representative, Architect's representative, prime Contractor's representative.
 - 4. Review all pertinent requirements for achieving the warranty specified below and set schedule for final warranty inspection.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened labeled packaging until ready for installation.
- B. Store products in a covered, ventilated area, at temperature not more than 110 degrees F (43 degrees C); do not store near steam pipes, radiators, or in sunlight.
- C. Store bundles on flat surface to maximum height recommended by manufacturer; store rolls on end.
- D. Store and dispose of solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 WARRANTY

A. Provide GAF Materials Corporation Smart Choice Limited Lifetime Warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: GAF Materials Corporation; 1361 Alps Rd., Wayne, NJ 07470. ASD. Toll Free Tel: (888) 532-5767. Tel: (888) 532-5767. Fax: (973) 628-3866. Website: http://www.gaf.com.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 25 00.

2.2 SHINGLES

- A. Heavyweight, granule surfaced, self sealing asphalt shingle with a strong fiberglass reinforced Micro Weave core and a mineral granule surfacing. Dovetail cut tabs and bold shadow lines provide a slate appearance with a 6 inch (191 mm) exposure. Meets ASTM D 3018, ASTM D 3161, and ASTM D 3462; UL 790 Class A rated with UL 997 Wind Resistance Label. Lifetime warranted Timberline Armorshield II Shingles by GAF.
- B. Color:
 - 1. As selected by Architect from manufacturer's full range.

2.3 HIP AND RIDGE SHINGLES

- A. High profile self sealing hip and ridge cap shingle matching the color of selected roof shingle. Each bundle covers approx. 20 lineal feet (6.01 m). Timbertex Distinctive Ridge Cap Shingles by GAF.
- B. Ridge cap shingle field fabricated from the same color and type of field shingle. Each bundle covers approx. 33 lineal feet (10.06 m).

2.4 UNDERLAYMENT

- A. Leak Barrier:
 - Self-adhering, self sealing, bituminous leak barrier surfaced with fine, skid-resistant granules. Each Roll contains approx. 150 sq ft (14 sqm), 65 lbs (29.9 kg), 36 inches by 50 feet (914 mm by 15.24 m) or 200 sf (23 sqm), 85 lb (38.6 kg), 36 inches by 66.7 feet (914 mm by 20.33 m). 58 mils (1.5 mm) thick. WeatherWatch by GAF.
- B. Roof Deck Protection:
 - 1. #30 Roofing Underlayment: Water repellent breather type cellulose fiber building paper. Meets or exceeds the requirements of ASTM D 4869 Type II.

2.5 ASSOCIATED PRODUCTS

- A. Fasteners
 - 1. Standard round wire shingle type, zinc-coated steel or aluminum; 10 to 12 gauge (3.416 mm to 2.657 mm for steel) (2.588 mm to 2.052 mm for aluminum), barbed or deformed shank, with heads 3/8 inch (9.5 mm) to 7/16 inch (11 mm) in diameter; length sufficient to penetrate at least 3/4 inch (19 mm) into solid wood or just through plywood or oriented strand board.

- B. Roofing Cement:
 - 1. Asphalt Plastic Roofing Cement meeting the requirements of ASTM D 4586 Type I or II.
- C. Metal Flashing:
 - 1. 24 gauge (0.607 mm) hot-dip galvanized steel sheet, complying with ASTM A 653/A 653M, G90/Z275.
 - 2. Use metal flashings at:
 - A. Eave edges.
 - B. Rake edges.
 - C. Step flashing at chimneys, side walls and dormers.
 - D. Valleys.

2.6 VENTILATION

- A. Ridge Vent:
 - 1. Flexible ridge ventilator designed to allow the passage of air from attics. Provides 16.9 sq. inches (10903 sqmm) NFVA (Hand Nail) and 14.1 sq. inches (9097 sqmm) NFVA (Nail Gun) per lineal foot. Cobra Ridge Vent, by GAF.
- B. Soffit Vents:
 - 1. GAF Cobra Fascia Vent: Provide soffit vents unless already existing or to be installed by others.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until roof deck has been properly prepared.
- B. If roof deck preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean deck surfaces thoroughly prior to installation of leak barrier and underlayment.
- B. At areas to receive leak barrier, fill knot holes and cracks with latex filler.

3.3 UNDERLAYMENT INSTALLATION

- A. Install using methods recommended by manufacturer in accordance with local building code.
- B. Eaves:
 - 1. Place eave edge metal flashing tight with fascia boards; lap joints 2 inches (50 mm) and seal with plastic cement; nail at top of flange.
- C. Valleys:

- 1. Install leak barrier at least 36 inches wide centered on valley; lap ends 6 inches (150 mm) and seal.
- 2. Where valleys are indicated to be "open valleys", install metal flashing over leak barrier before roof deck underlayment is installed; DO NOT NAIL THROUGH flashing; secure by nailing at 18 inches (457 mm) on center just beyond edge of flashing so that nail heads hold down edge.
- D. Roof Deck:
 - 1. Install one layer of roof deck underlayment over entire area not protected by eave or valley membrane; run sheets horizontally lapped so water sheds; nail in place.
 - 2. On roofs sloped at more than 4 in 12, lap horizontal edges at least 2 inches (50 mm) and at least 2 inches (50 mm) over eave protection membrane.
 - 3. On roofs sloped between 2 in 12 and 4 in 12, lap horizontal edges at least 19 inches (480 mm) and at least 19 inches (485 mm) over eave protection membrane.
 - 4. Lap ends at least 4 inches (100 mm); stagger end laps of each layer at least 36 inches (915 mm).
 - 5. Lap underlayment over valley protection at least 6 inches (150 mm).
- E. Penetrations:
 - 1. At vent pipes, install a 24 inch (610 mm) square piece of leak barrier lapping over roof deck protection; seal tightly to pipe.
 - 2. At vertical walls, install leak barrier extending at least 6 inches (150 mm) up the wall and 12 inches (305 mm) on to the roof surface lapping over roof deck protection.
 - 3. At skylights and roof hatches, install leak barrier up the sides of the frame and 12 inches (305 mm) on to the roof surface on all sides, lapping over roof deck underlayment.
 - 4. At chimneys, install leak barrier around entire chimney extending at least 6 inches (150 mm) up the wall and 12 inches (305 mm) on to the roof surface lapping over roof deck protection.

3.4 INSTALLATION OF SHINGLES

- A. Install in accordance with manufacturer's instructions and requirements of local building code.
 - 1. Avoid breakage of shingles by avoiding dropping bundles on edge, by separating shingles carefully (not by "breaking" over ridge or bundles), and by taking extra precautions in temperatures below 40 degrees F (4 degrees C).
 - 2. Handle carefully in hot weather to avoid damaging shingle edges.
 - 3. Secure with 4 to 6 nails per shingle; use number of nails required by manufacturer or by code, whichever is greater. Nails must be long enough to penetrate through plywood or OSB, or 3/4 inch (19 mm) into dimensional lumber
- B. Install hip and ridge shingles as required by the manufacturer.
 - 1. At ridges, install hip and ridge shingles over ridge or ridge vent material;
- C. Make valleys using "open valley" technique:
 - 1. Snap diverging chalk lines on metal flashing, starting at 3 inches (75 mm) each side of top of valley, spreading at 1/8 inch per foot (9 mm per meter) to eave.
 - 2. Run shingles to chalk line.
 - 3. Trim last shingle in each course to match chalk line; do not trim shingles to less than 12 inches (305 mm) width.
 - 4. Apply 2 inches (50 mm) wide strip of plastic cement under ends of shingles, sealing to metal flashing.

3.5 VENTILATION

- A. Ridge Vent:
 - 1. Cut continuous vent slot through sheathing, stopping 6 inches (150 mm) from each end of

ASPHALT SHINGLES

ridge.

- 2. On roofs without ridge board, make slot 2 inches (50 mm) wide, centered on ridge.
- 3. On roofs with ridge board, make two slots 1-3/4 inches (89 mm) wide, one on each side.
- 4. Install ridge vent material full length of ridge, including uncut areas.
- 5. Butt ends of lengths of ridge vent material and join using plastic cement.
- 6. Install eave vents in sufficient quantity to equal or exceed the ridge vent area, calculated as specified by manufacturer.
- 7. Install ridge shingles over ridge vent material; use nails of specified length; do not drive nails home, leaving 3/4 inch (19 mm) slot open between ridge and roof shingles.

3.6 **PROTECTION**

- A. Stage work progress so that traffic is minimized over completed roofing.
- B. Protect installed products until completion of project.

3.7 EXTRA MATERIALS

A. 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, pattern and type of asphalt shingle installed.

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. Provide and install 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. 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. Vertical Siding: Hardiepanel as manufactured by James Hardie Building Products, Inc.
 - 1. Type: Sierra 8 inches (203 mm) Vertical siding panel 4 feet by 8 feet (1219 mm by 2438 mm).
- C. Trim: Hardietrim Fascia and Moulding as manufactured by James Hardie Building Products, Inc.

2.3 FASTENERS

- A. Wood Framing Fasteners:
 - 1. Wood framing: 4d common corrosion resistant nails.

2.4 FINISHES

- A. Factory Primer: Provide factory applied universal primer.
 - 1. Primer: PrimePlus by James Hardie.
 - 2. Topcoat: Refer to Section 09 91 00 and Exterior Finish Schedule.

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.

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 - 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.

3.4 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.

3.5 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.

3.6 **PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

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.

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 Projectsite 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. Frames for Level 3 Steel Doors: minimum 16 gauge 0.053-inch- (1.3-mm-) thick steel sheet.
 - 4. Frames 48-inches and wider in opening width are required to be minimum 14 gauge 0.067-inch-(1.7-mm-) thick steel sheet.
 - 5. Frames for Wood Doors: minimum 16 gauge 0.053-inch- (1.3-mm-) thick steel sheet.

- 6. 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.
- 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.

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 4¹/₂" x 4¹/₂" for all 1³/₄" thick doors up to and including 36 inches wide. Doors over 1³/₄" through 2¹/₄" thick, use 5" x 5" hinges. Doors over 36 inches use 5" x 4¹/₂" 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 nonpublic 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): 100 101

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	А	ZER
1	EA	RAIN DRIP	142A-HEAD PLUS 4"	А	ZER

HARDWARE GROUP NO. 02 - EXTERIOR - FAMILY RESTROOM

FOR USE ON MARK/DOOR #(S):

102

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	А	ZER
1	EA	RAIN DRIP	142A-HEAD PLUS 4"	А	ZER
1	EA	COAT AND HAT HOOK	582B26D	626	IVE

HARDWARE GROUP NO. 03 - EXTERIOR - EQUIPMENT ROOM

FOR USE ON MARK/DOOR #(S):

103

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	А	ZER
1	EA	RAIN DRIP	142A-HEAD PLUS 4"	А	ZER

HARDWARE GROUP NO. 04 - EXTERIOR - STORAGE

FOR USE ON MARK/DOOR #(S):

104

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	А	ZER
1	EA	RAIN DRIP	142A-HEAD PLUS 4"	А	ZER

SECTION 08 90 00 - LOUVERS AND VENTS

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

- A. Section Includes:
 - 1. Wall vents (block vents).
- B. See Division 8 Section "Steel Doors and Frames" for louvers in hollow-metal doors.
- C. See Division 15 Sections for louvers that are a part of mechanical equipment.

1.3 PERFORMANCE REQUIREMENTS

- A. Design: Design louvers, including comprehensive engineering analysis by a qualified engineer, using structural performance requirements and design criteria indicated.
- B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.
 - 1. Wind Loads: Determine loads based on a uniform pressure of 30 lb./sq. ft. (1435 Pa), acting inward or outward.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
- C. Samples: For each type of metal finish required.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Extrusions: ASTM B 221M, Alloy 6063-T5.
- B. Fasteners: Use types and sizes to suit unit installation conditions.
 - 1. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.

2.2 FABRICATION, GENERAL

- A. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
- B. Join frame members to each other and to fixed louver blades with fillet welds concealed from view welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 WALL VENTS (BLOCK VENTS)

- A. Extruded Aluminum Brick Vents (MODEL EX):
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Architectural Louvers Co. (Harray, LLC); Model EX or comparable product by one of the following:

Manufacturers of equivalent products submitted and approved in accordance with Section 01 25 00 - Product Substitution Procedures.

2. Extruded-aluminum louvers and frames, not less than 0.125-inch (3.18-mm) nominal thickness, assembled by welding; with 18-by-14- (1.4-by-1.8-mm-) mesh, aluminum insect screening on inside face; incorporating weep holes, continuous drip at sill, and integral waterstop on inside edge of sill; of load-bearing design and construction.Frame and Blade Nominal Thickness: Not less than 0.063 inch (2.03 mm) for blades and frames.

2.4 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
- B. Louver Screen Frames: Same kind and form of metal as indicated for louver to which screens are attached.
- C. Louver Screening: Same kind of metal as indicated for louver.
 - 1. Insect Screening: Aluminum, 16 x 16 square mesh, 0.011-inch (0.28-mm) wire.

2.5 ALUMINUM FINISHES

A. High-Performance Organic Finish: 3-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2.6 INSTALLATION

- A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weather-tight connection.
- C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- D. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory and refinish entire unit or provide new units.

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:

- 1. <u>Primer on gypsum board:</u> SW PrepRite High Build Primer B28W601 one coat over light to medium texture (submit texture sample for approval)
- 2. <u>Eggshell Enamel on Drywall:</u> SW Pro Mar 400 Latex Eg-Shel B20W4400 one coat over specified primer.
- 3. <u>Semi-Gloss Enamel on Drywall:</u> SW Pro Mar 400 Latex Semi Gloss B31W4400 one coat over specified primer.
- 4. <u>Epoxy Paint on Drywall:</u> One coat SW PrepRite 200 Latex Primer B28W200 over specified primer.
- 5. <u>Gloss Enamel on Drywall:</u> Two coats SW Water Based Catalyzed Epoxy B70 Series gloss acrylic over specified primer.
- 6. <u>Semi-Gloss Enamel on shop-primed metals</u>: SW Water Based Industrial Enamel B53-300 acrylic gloss Enamel two coats.
- 7. <u>Natural Finish on Wood</u>: SW Sherwood BAC Wiping Stain (one coat) + SW Wood Classics Sanding Sealer B26V3 (one coat) + SW Wood Classics Satin Varnish A66.
- 8. <u>Clear Finish on Wood</u>: SW Wood Classics Polyurethane Varnish A67 (two coats). Sand lightly between all coats.
- 9. <u>Block Filler</u>: 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. <u>Gloss Enamel on CMU or concrete</u>: Two coats block filler plus two coats SW Water based Industrial Enamel gloss acrylic latex over specified primer.

- 11. <u>Semi-Gloss Enamel on CMU or concrete</u>: Two coats block filler plus two coats SW Water Based Industrial Enamel semi-gloss acrylic latex over specified primer.
- 12. <u>Semi-Gloss Epoxy Paint on concrete</u>: 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. <u>Gloss Epoxy Paint on CMU</u>: Two coats block filler (unless surface-bonded) plus finish coat of gloss. Minimum paint thickness 3.0 dry mils.
- 14. <u>Gloss Epoxy Paint on concrete</u>: 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. <u>Semi-Gloss Enamel on utility piping and galvanized metals</u>: SW Pro-Cryl Universal Metal Primer – one coat + SW DTM Acrylic Semi Gloss – two coats.
- 16. <u>Semi-Gloss Epoxy Paint on CMU</u>: Two coats block filler plus finish coat of SW Water Based Epoxy semi-gloss. Minimum paint thickness 3.0 dry mils.
- 17. <u>Gloss Aliphatic Urethane Enamel on primed steel railings:</u> Over epoxy shop primer apply two coats SW Hydrogloss Single Component Water Based Urethane B65-181 Urethane Gloss Enamel using airless spray equipment.
- 18. <u>Dry Fall Acrylic</u> (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. <u>Gloss Enamel on Galvanized Metals:</u> SW Pro-Cryl Universal Metal Primer B66W310 (one coat) + SW Sher-Cryl HPA B66-300 enamel – two coats.
 - 2. <u>Block Filler on CMU:</u> SW Heavy Duty Block Filler B24W46, one coat.
 - 3. <u>Gloss Enamel on Shop-Primed Metals:</u> SW Sher-Cryl HPA B66-300 gloss enamel-two coats.
 - 4. <u>Gloss Enamel on Aluminum:</u> SW Pro-Cryl Universal Metal Primer B66W310 (one coat) + SW Sher-Cryl HPA B66-300 gloss enamel two coats.
 - 5. <u>Field Welds:</u> "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.

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. <u>Provide 12" x 12" samples of actual paint for each color</u> 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

F. 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.

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.

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.
- 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. 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.

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

2.2 MATERIALS

- A. ROOM IDENTIFICATION PLAQUES:
 - 1. 6" X 9" X $\frac{1}{4}$ " 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.

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.

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 solid phenolic 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 accessories as indicated in the drawings and as specified herein.
- C. Provide and install adult changing table as indicated in the drawings and as per manufacturer's recommendations.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Wood blocking between studs.
- B. Wall and floor finishes.

1.4 SUBMITTALS

A. SOLID PHENOLIC PARTITION SYSTEMS:

- 1. Submit shop drawings for solid phenolic partition system indicating plan and elevation dimensions and mounting details. Submit hardware samples and full chain of melamine 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. SOLID PHENOLIC PARTITION SYSTEMS:
 - 1. Bobrick Washroom Equipment
 - 2. American Specialties, Inc.
 - 3. Ampco
 - 4. General Partitions
 - B. ACCESSORY MANUFACTURER:
 - 1. Bobrick Washroom Equipment
 - C. VANDAL RESISTANT ACCESSORY MANUFACTURER:
 - 1. Vandal Stop Products by Atlas American, LLC.

2.2 TOILET ROOM ACCESSORIES:

- 1. <u>Grab bars:</u> 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. Mop Holder: Bobrick B223X24 stainless steel. Furnished and installed by Contractor.
- <u>Paper Towel Dispensers:</u> Recessed Paper Towel Dispenser and Waster Receptacle shall be Model B-369 of Bobrick Washroom Equipment, Inc. Also provide Bobrick Model No. 369-130 Towel-Mate. <u>Furnished and installed by Contractor.</u>

- 4. <u>Soap dispensers:</u> Vandal Stop Products Model #VSP-SD-PF, surface mounted. Manufactured by Atlas American LLC. <u>Furnished and installed by Contractor</u>. Provide with liquid soap.
- 5. <u>Tissue dispensers:</u> Vandal Stop Products Model #AA-HRTDx2E, surface mounted. Manufactured by Atlas American LLC. <u>Furnished and installed by Contractor.</u>
- 6. <u>Adult Changing Table:</u> PRESSALIT CARE 1000 (R8407000) Fixed Height. Size: 29.4" x 70.9" Maximum Load shall be 330 lbs. <u>Furnished and installed by Contractor.</u>

2.3 SOLID PHENOLIC PARTITION SYSTEMS:

- A. STILES, PANELS, DOORS, SCREENS
 - 1. Solid phenolic material constructed of solidly fused plastic laminate with matte-finish melamine surfaces, colored face sheets, and black phenolic-resin core that are integrally bonded. Edges shall be black. Brown edges shall not be acceptable. Color and pattern as selected by architect from manufacturer's standard colors.
 - 2. Solid phenolic material shall meet National Fire Protection Association and International Build ing Code Interior Wall and Ceiling Finish Class A, Uniform Building Code Class I, ASTM E-84 Fire Resistance Standards; flame spread 20, smoke density 95.
 - 3. Finish Thickness
 - a. Stiles and doors shall be 3/4" (19mm).
 - b. Panels and benches shall be 1/2" (13mm).

B. PERFORMANCE REQUIREMENTS:

- 1. Graffiti Resistance (ASTM D 6578): Passed cleanability test; 5 staining agents.
- 2. Scratch Resistance (ASTM D 2197): Maximum load value exceeds 10 kilograms.
- 3. Impact Resistance (ASTM D 2794): Maximum impact force exceeds 30 inch-pounds.
- 4. Smoke Developed Index (ASTM E 84): Less than 450.
- 5. Flame Spread Index (ASTM E 84): Less than 75.
- 6. National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class B.
- 7. Uniform Building Code: Class II.

C. HARDWARE

- 1. All hardware to be 18-8, type-304 stainless steel with satin-finish.
- 2. All hardware shall be concealed inside compartments with the exception of outswing doors.
- 3. Hardware of chrome-plated "Zamak" is unacceptable.

D. LATCH

- 1. Sliding door latch shall be 16-gauge (1.6mm).
- 2. Sliding door latch shall require less than 5-lb force to operate. Twisting latch operation will not be acceptable.
- 3. Latch track shall be attached to door by flathead machine screws into factory installed threaded brass inserts.

- 4. Latch handle shall have rubber bumper to act as door stop.
- 5. Latch shall allow door to be lifted over 16-gauge (1.6mm) keeper for emergency access.
- 6. Metal-to-metal connection shall withstand a direct pull of over 1,500 lb. per screw.
- E. HINGES
 - 1. Cam shall be adjustable in the field to permit door to be fully closed or partially open when compartment is unoccupied.
 - 2. Hinges shall be attached to door and stile by theft-resistant, one-way stainless steel machine screws into factory-installed metal inserts. Fasteners secured directly into the core are not acceptable.
 - 3. Metal-to-metal connection shall withstand a direct pull of over 1,500 lb. per screw.
- F. Clothes Hook shall be constructed of stainless steel and shall project no more than 1-1/8" (29mm) from face of door. Clothes hook shall be secured by theft-resistant, one-way stainless steel screws.
- G. Mounting Brackets shall be constructed of stainless steel and shall be mounted inside compartment. Mounting brackets exposed on the exterior of the compartment will not be acceptable. Wall mounted urinal screen brackets shall be 11-gauge (3mm) double thickness.
- H. Leveling Device shall be 3/16" (5mm) hot rolled steel bar; chromate-treated and zinc-plated; through bolted to base of solid phenolic stile.
- I. Stile Shoe shall be one-piece, 4" (102mm) high, type-304, 22-gauge (0.8mm) stainless steel with Satin finish. Top shall have 90° return to stile. Patented one-piece shoe capable of adapting to 3/4" or 1" stile thickness and capable of being fastened (by clip) to stiles starting at wall line.
- J. Headrail (Overhead-Braced) shall be satin finish, extruded anodized aluminum (.065" / 1. 65mm thick) with anti-grip profile. <u>Type:</u> Floor mounted, overhead braced continuously over entire system.

PART 3 - EXECUTION

3.1 INSPECTION

A. Ensure that Contractor has properly installed solid wood blocking between studs at all mounting points.

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. Install adult changing table as per manufacturer's recommendation. Provide additional reinforcing within cmu walls as required for proper installation to support maximum load.
- C. 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.

D. 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.

SECTION 31 10 00 — SITE CLEARING, GRADING AND FILLING

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. Clearing, filling and grading of the affected areas of the site.
- B. Top Soil removal and reuse.
- C. Disposal of debris and surplus materials.
- D. Protection of trees and vegetation to remain, coordinate with the Architect.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS:

- A. Excavation and backfilling for underground site utilities.
- B. Paving and sidewalks.
- C. Site drainage systems.

1.4 QUALITY ASSURANCE

- A. Testing Laboratory Services: Installed materials shall meet specified requirements as determined by the Owner's Testing Laboratory.
- B. Proposed sitework contractor shall be able to provide documentation that he has a minimum of three years of satisfactory experience in the performance of similar operations.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Existing top soil to be stockpiled and reused.
- B. Existing and off-site earth fill as required.
- C. TOPSOIL:
 - 1. Rich sandy loam, low in silt, free of trash, rocks, debris and other foreign materials.
 - 2. Topsoil stripped at the site and stockpiled may be used if material meets the above requirements and quantities are sufficient to meet all topsoil needs of the site. Otherwise topsoil meeting specified requirements and approved by the testing laboratory shall be provided from an approved off site source.
- D. FERTILIZER AND GRASSING: Provide grass to replace any disturbed areas during regarding.

PART 3 - EXECUTION

3.1 PROTECTION OF EXISTING TREES AND VEGETATION

- A. GENERAL: In addition to any temporary construction fencing provided under Section 01 50 00 Temporary Facilities, provide temporary chain link fencing around existing shrubs, grasses, ground cover and tress indicated to remain. Locate fencing around drip lines of individual trees or groups of trees.
- B. REPLACEMENT: Replace damaged existing trees and vegetation indicated to remain with materials of like kind, size and maturity as approved by the architect. Follow supplier's recommended procedures of planting.

3.2 TOPSOIL REMOVAL AND EXCAVATION

- A. Strip topsoil to a depth of 4" to 6" under all new site paving, sidewalks, within new building lines and at all site areas which will receive earth fill for grading adjustments.
- B. Temporarily store removed topsoil at an on-site location designated by the Architect. Stored topsoil shall be kept free of trash and construction debris.
- C. Remove additional existing soil as required to achieve any finish paving grades which may be at or near natural grade elevation.

3.3 EXCAVATING, GRADING AND FILLING

- A. GRADE ELEVATIONS: Establish finish grades as indicated on the drawings. Set and maintain grade stakes.
- B. ROUGH GRADING:
 - 1. Provide clean earth fill meeting specified requirements from off-site should additional earth fill be required.
 - 2. Provide temporary and permanent drainage swales, pumps, gutters and trenches necessary to dry existing soil and carry off water during construction. As indicated on drawings shape the site around structures to drain away from the building(s) at all times. Do not allow water to stand around trees scheduled to remain.

- 3. All site fill at unpaved and typical sidewalks areas shall be thoroughly compacted in lifts as specified below. Each layer and subgrade shall be wetted or dried as required to achieve optimum moisture content and then compacted to minimum ninety (90%) percent Proctor density per ASTM D1557. The subgrade shall be thoroughly and completely scarified before wetting and rolling.
- C. COMPACTION: Compaction may be obtained by any of the following methods:
 - 1. By sheepsfoot rollers having a unit weight on the contact feet of not less than 300 pounds per square inch with the soil being compacted in layers not exceeding 8" in depth (loose measurement).
 - 2. By pneumatic tired rollers having a minimum compression of 325 pounds per inch of width of tire tread, with the soil being compacted in layers not exceeding 8" in depth (loose measurement).
 - 3. For those portions of fill which cannot be reached with the sheepsfoot roller, such as corners and areas adjacent to columns, beams, etc., mechanical tampers shall be employed to obtain specified compaction.

D. EXISTING UTILITIES:

- 1. Arrange with utility companies for removal or relocation of any existing utilities.
- 2. Remove abandoned utilities up to the property line and provide permanent watertight cap.
- 3. If unknown or uncharted utilities are encountered during excavation, promptly notify the Architect before proceeding. Damage to existing utilities by continuing work without notifying the Architect shall be repaired by the Contractor at no additional cost to the Owner.

E. FINISH GRADING;

- 1. After rough grading and proof rolling operations are complete, install 2" of topsoil over unpaved open area (within the limits of grading) and fine grade to finish contours and make ready to receive grass planting (whether or not grass planting is required under this contract).
- 2. Open areas shall be raked smooth and left free of clumps, trash, debris and vegetation. Finish grading shall be uniform in planarity, meeting elevations and slopes as indicated on the drawings, and as required to ensure proper drainage.

3.4 DISPOSAL:

- 1. Adhere to Federal, State, County and local regulations regarding disposal of removed trees, shrubs, vegetation, soil, and rubble. It is the sole responsibility of the Contractor to determine the regulations regarding on-site burning of removed trees and vegetation.
- 2. Upon completion of fine grading operations, any excess soil shall be removed from the site, stockpiled at the site, or relocated to any property controlled by the Owner within five miles of the site. The above options shall be as determined by the Owner at no additional cost to the Owner.

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.

SECTION 32 13 13 — CONCRETE PAVING, CURBS AND SIDEWALK

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. All site concrete work, including sidewalks, paving, equipment slabs, ramps, and other miscellaneous concrete.
- B. All form work.
- C. Reinforcing steel.
- D. Installation of sleeves provided by plumbing, heating, and electrical contractors for work under site concrete. Sleeves for irrigation system.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Testing Laboratory services.
- B. Excavation and fill.
- C. Soil stabilization.
- 1.4 DRAWING REFERENCES: See drawings for reinforcing sizes and placement.

1.5 SUBMITTALS

A. DESIGN MIX: Submit six (6) copies directly to the Owners Testing Laboratory the proposed concrete mix for concrete paving and sidewalks. Include cement brand and type, aggregate identification, admixtures, proportions and anticipated strengths.

- B. PLASTIC CHAIR SUPPORT: Submit manufacturer's literature indicating dimensions, configuration, and performance data. Submit sample for approval by the Architect.
- C. JOINT FORMS: Submit manufacturer's literature indicating dimensions, configuration, reinforcing and accessories related to load transfer units.
- D. ADMIXTURES: Submit manufacturer's literature indicating composition and mix proportions.
- E. CURING COMPOUND: Submit manufacturer's literature indicating composition and recommended application procedures.
- F. JOINT SEALANT: Submit manufacturer's literature indicating sealant type(s), performance, recommended application procedures, and recommending open or closed cell backer material for the application.
- G. DELIVERY TICKETS: Furnish copies of delivery tickets for each load of concrete delivered to the site. Provide items of information as follows:
 - 1. Ambient temperature.
 - 2. Any modifications and dispositions of the load.
 - 3. Driver's identification.
 - 4. Identification of placement location at jobsite.
 - 5. Ingredients by weight.
 - 6. Number of cubic yards.
 - 7. Time emptied.
 - 8. Time loaded.
- H. TEST REPORTS: Arrange for the Owner's Testing Laboratory to submit reports to the Owner, Architect and Contractor indicating compressive strength, aggregate type and slump for samples taken at the site.

1.6 SAMPLES

- A. Plastic chair support.
- B. Minimum 36" x 36" finish samples at the job site for Architects approval. Provide sample for each type of finish (smooth, light broom, medium broom, etc.) and each type of joint.

1.7 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.

1.8 QUALITY ASSURANCE

- A. Cast-in-place concrete shall be installed by technicians specially trained in the proper handling, placing and protection of concrete and reinforcing steel. If required by the Architect, installer shall submit for approval a list of similar installations successfully completed.
- B. Cast-in-place concrete shall be mixed and installed in strict accordance with applicable written recommendations and requirements of the Texas State Department of Highways and Public Transportation (TSDHPT) and the American Concrete Association (ACI) including but not necessarily

limited to the following where documents conflict, the most stringent of the requirements as determined by the Architect shall apply:

- 1. TSDHPT, item 360.
- 2. ACI 302.
- 3. Building Code Requirements for Reinforced Concrete, ACI 318.
- 4. Recommended Practice for Hot Weather Concreting, ACI 305.
- 5. Recommended Practice for Cold Weather Concreting, ACI 306

PART 2 - PRODUCTS

2.1 MATERIALS

- A. GENERAL: All materials used in the Work shall be stored or handled in a manner which will prevent deteriorations; any materials that have been damaged shall be immediately and completely removed from the Work. All manufactured materials, such as cement, shall be delivered and stored in their original packages, plainly marked with the brand and manufacturer's name. Broken packages or packages that show marks or other evidence of damage shall be wholly rejected.
- B. CEMENT: Portland cement shall conform to standard specifications of ASTM,C-150, Type l, latest edition. The brand shall be one approved by the Architect, and this one brand shall be used throughout the project.
- C. AGGREGATES: Aggregates for concrete of normal weight shall be clean, hard, strong, uncoated, free of loam, fine sand, clay dust, organic or other deleterious matter and shall conform to ASTM C-33.

FINE	AGGREGATE			COARSE AGGREGATE	
Sieve Size	Percent	Sieve Size	1-1/2	Percent	3/4
	Passing	Passing			
4	95-100	1-1/2	95-100	-	-
16	50- 88	1"	-	90-100	-
50	10-30	3/4"	40-70	-	90-100
100	0- 5	1/2"	-	25-60	
		3/8"	10-30	-	20-55
		#4	0- 5	0- 10	0- 10

- D. Clay 3% Maximum Clay 1 % Maximum
- E. WATER: Water shall be clean and potable, free from injurious amounts of oil, acid, Alkali, organic matter or other deleterious substances.
- F. REINFORCING STEEL: All reinforcing steel shall be high bond, new billet stock, and shall conform with ASTM A-615, except that mesh shall conform with ASTM A-1 85. All materials must be free from seams, flaws, scale or an excessive amount of rust. The supplier shall furnish Architect with a certificate certifying the reinforcing steel is domestic, or supply laboratory tests acceptable to the Architect, that foreign steel meets these tests. Laboratory tests shall be made on each size of steel. Samples for testing shall be taken from jobsite. The samples shall be replaced with bar of like size and length, plus 40 diameter.
- G. ANCHORS: Install all necessary anchors, wire loops or other miscellaneous fasteners to be installed in concrete for anchoring masonry or other work.
- H. WOOD JOINT FORMS:
 - 1. Sidewalk Joints: Expansion joints at concrete walks shall be 1X Redwood.
 - 2. Paving Joints: 3/4" thick redwood form with minimum 1" deep removable top strip, 3/4" x 1 0" steel reinforcing bars at 24" o.c. with bond-breaker sleeve on one side, and 3/16" thick steel rebar support plates each side. Provide custom size as required for full depth of paving as manufactured by Shepler Equipment Co., or equivalent by Commercial Lumber Supply, Marine Lumber Co., or Southern States Lumber.
- I. TRANSIT MIX CONCRETE: Contractor shall provide concrete meeting the specifications with regard to compressive strength, method of handling, and controlled by testing lab at batch plant. Concrete shall meet ASTM C-94; Certificate from supplier shall be furnished to Architect.
- J. CURING COMPOUND: Shall be Southform 4-way (cures, seals, dustproofs, and hardens), or equivalent product by Gifford-Hill, Nox-Chem, Sonneborn, or W.R. Grace.
- K. ADMIXTURES:

- 1. General: All admixtures shall be added at the plant during mixing and must be prior approved by the Testing Laboratory. Admixtures shall comply with requirements of ASTM C-260 and C-494. Admixtures containing calcium chloride are not acceptable. **Do not use admixtures in footings or seal slabs.**
- 2. Water Reducing Agents: All design mixes must test with the required slumps prior to the addition of a water reducing agent. Each specified maximum slump may be increased by a maximum of 2" at the plant by the addition of a maximum of 3 ounces of water reducing agent per 94 pound bag of cement. Meet requirements of ASTM C494, Type F.
 - a. "PSI Super" as manufactured by Cormix Construction Chemicals.
 - b. "WRDA-1 9" as manufactured by W.R. Grace.
 - c. "Sikament" as manufactured by Sika Chemical Corp.
- 3. Set-Controlling Agents: Under 40 degrees F., add accelerating agent Over 80 degrees F., add retarding agent.
 - a. Cormix Construction Chemicals.
 - b. Master Builders
 - c. Protex Industries
 - d. Sika Chemical Corp.
- 4. Air Entrainment: All structural concrete shall contain an air entraining agent compatible with other approved admixtures. Agent added at the plant shall produce 4-5% air entrainment not required at drilled footings.
- L. REINFORCING BAR SUPPORTS: Heavy-duty type four-legged plastic chair supports with sand plate. Series "G" or "B" (as determined by job conditions) as manufactured by W.H.C. Products, Inc. or approved equivalent by Aztec Concrete Accessories. Provide sand plate for slab on grade. Space at a maximum of 45" centers each way. Provide closer spacing where required to prevent excessive sag, or to support the weight of concrete pump hose.
- M. METAL REINFORCEMENT:
 - 1. Bars
 - a. General: Detailing conform to ACI detailing manual.
 - b. Grade 60: Comply with ASTM A 615.
 - c. Grade 40 (#3 bars): Comply with ASTM A 615.
 - 2. Mesh
 - a. Comply with ASTM A 185.
 - b. Mesh shall be type which is fabricated and delivered in flat sheets.
 - c. Use mesh only where specifically indicated in the drawings for sidewalks or equipment pads.
- N. PAVING JOINT SEALANT: Polyurethane base, multi-component, chemical curing, self-leveling Type 1, conforming to requirements of FS TT-S-00227E, Class A (provide equivalent non-sagging Type 2 at vertical joints in curbs), as manufactured by Tremco or equivalent by Sonneborn, Sheplers, or Pecora. Use with flat strip, non-absorbent polyethylene joint backer-open or closed cell type as recommended by the sealant manufacturer.

2.2 MIX DESIGNS

The concrete mix shall be designed by the concrete supplier and approved by the Owner's Testing A. Laboratory. Contractor shall furnish to the laboratory samples of the aggregate he proposes to use in the concrete work. Concrete mixes shall achieve twenty eight (28) day compressive strengths indicated below, and shall be so proportioned as to obtain a workable mix in accordance with the following limits:

B.	Compressive Strength	Minimum Cemen	t Maximum Total
C.	at 28 days	Content 94#	SacksWater Per Sack of Cement
D.	Minimum P.S.I.	Cubic Yard	Gallons
E.	Paving 3,500	5.5	7.0

- SLUMPS: Slumps greater than specified can adversely affect concrete performance due to excessive F. shrinkage. Slumps specified below are based upon concrete design mix prior to addition of any approved water reducing agent.
 - 5"+/-1": Sidewalks 1.
 - 2. 3"+/-1": Paving.curbs
- G. The use of fly ash in the concrete mix is not acceptable.
- MIXING H.
 - 1. Comply with ASTM C 94.
 - 2. Mix concrete to a uniform distribution of materials. Mix at least two minutes after materials are in mixer. Discharge concrete completely before mixer is recharged.
 - 3. Mix each batch not less than 70 or more than 100 revolutions of the drum at mixing speed. Additional mixing is to be done at agitating speed.
- I. ADJUSTMENTS TO MIX DESIGN: Submit for approval by the Owner's Testing Laboratory any proposed adjustments to the approved mix design due to job conditions, weather or testing results. Necessary adjustments to the mix design shall be at the Contractor's expense.

PART 3 - EXECUTION

3.1 PREPARATION

- Any portions of the subgrade or fill that are below optimum moisture content shall be wetted at least one А. (1) week prior to placing concrete in order to achieve a proper uniform distribution of moisture.
- All preliminary work shall be carefully checked, all trash and debris removed, and the approval of the B. Architect obtained before any concrete is placed. The Architect shall be notified twenty-four (24) hours before any concrete is scheduled to be placed.
- C. SUBGRADE APPROVAL- The bearing grade of slab-on-grade concrete shall require approval of the Owner's testing laboratory immediately prior to the placement of concrete regardless of any previous test results. Bearing grade which is overly dry, saturated, exhibits standing water, contaminants, irregularities or other properties which may tend to be deleterious to the performance of the cast-in-place concrete will not be approved by the Owner's testing laboratory as suitable for concrete placement.

- D. Coordinate and provide for plumbing, electrical, carpentry, masonry, miscellaneous metals and other installation requirements, which must be completed prior to concrete work or which may require special forming or block-outs.
- E. CLEANING: Clean all forms of debris and thoroughly wet wood forms before placing concrete.
- F. Inspect subgrade to determine that uniform thickness of concrete paving and walks will result in proper drainage and no standing water. Notify Architect prior to beginning work of any no slope areas or potential standing water conditions.
- G. HOT WEATHER CONDITIONS: Where ambient temperature exceeds 95 degrees F. with a wind velocity exceeding 5 MPH or temperature exceeds 90 degrees F. with a wind velocity exceeding 15 MPH, follow recommendations in ACI publication "SLABS ON GRADE" to protect against rapid drying.
- H. Do not place concrete when air temperature is 40 degrees F. or below or when the air temperature is expected to go below 30 degrees F. in the following 48 hours after placing of concrete unless the concrete is protected from such temperature.
- I. Install all anchors, fasteners, junction boxes, curb dowels collection boxes or other construction to be installed within concrete paving.

3.2 INSTALLATION

- A. TRANSIT: Concrete shall be agitated continuously with slow revolutions of the drum white in transit. No concrete shall be deposited after being in the mixer more than 90 minutes. Testing laboratory shall check each delivery ticket and notify Contractor immediately of any concrete arriving more than 90 minutes after plant loading.
- B. HANDLING: Concrete shall be deposited in the forms as rapidly as practicable by methods which will prevent loss or separation. It shall be deposited as nearly as practicable in its final position to avoid rehandling. Provide runways, or other means for wheeled equipment to carry concrete to points of deposit.

C. PLACING REINFORCEMENT:

- 1. A thin film of rust will not be considered objectional, but no loose or scaly rust, dirt, mud or cement will be allowed. Steel must be cleaned with wire brushes or replaced if pitted from rust.
- 2. Accurately position, secure against displacement with #18 gauge wire ties or suitable clips, support by heavy duty plastic chairs with sand plates. Do not use "brick batts" or rubble for support.
- 3. Follow recommendations of Concrete Reinforcing Steel Institute as to type of steel, splicing, location and placement.

D. PLACING CONCRETE:

- 1. Deposit and consolidate concrete in a continuous operation, within the limits of joint forms, until the placing of a panel or section is completed.
- 2. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement, other embedded items, and into corners.
- 3. Maintain reinforcing steel in the proper position continuously during concrete placement operations.
- 4. Bring slab surfaces to the correct plane with a straight edge or vibrating screed and strike off. Use bull floats or derbies to smooth the surface, leaving it free of humps or hollows. Do not sprinkle

water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.

5. Concrete surface shall be true to plane within 1/4" against a 10' straight edge.

3.3 JOINTS

A. LOAD TRANSFER UNITS:

- 1. Install wood joint form in accordance with manufacturer's printed directions prior to concrete pour. All plastic sleeves at reinforcing bars shall be placed running in same direction.
- 2. Install manufacturers stakes at 48" o.c. maximum where concrete is to be placed on both sides of form simultaneously. Install at 36" o.c. maximum at cold joints.
- 3. Longitudinal joint forms shall be continuous through transverse joint forms.
- 4. Pre-wet form boards prior to placement to ensure against dry wood forms removing water at edges of concrete.
- 5. Leave removable top strip in place and protect until sealant operations begin.

B. WOOD FORMS:

- 1. Install similar to load transfer units. Use at radiused areas and sidewalks.
- 2. Kerf where required for radius.
- 3. Leave removable top strip in place at paving and protect until sealant operations begin. Top strip and sealant not required at sidewalks.

C. KEYED JOINTS:

- 1. Align metal joint forms and install manufacturer's splice clip at ends to keep joints in alignment during concrete placement.
- 2. Set all stakes securely to keep joint form from moving during concrete placement.
- 3. Do not remove forms until concrete has obtained sufficient strength. When removing forms, apply no vertical uplift which may damage or weaken concrete key.

3.4 CURBS

- A. Provide machine laid (extruded) reinforced concrete curbs unless monolithic or formed curbs are indicated in the drawings.
- B. Apply epoxy to cured concrete paving and continuously lay curb over installed dowels.

3.5 FINISHING

- A. GENERAL: Concrete finishes shall match approved jobsite samples approved by the Architect. Spreading of dry cement for finishing is not acceptable. Begin finishing operations as soon as water sheen has disappeared from surface.
- B. PAVING FINISHES: Slabs shall be true to plane within 1/4" in a length of 10' machine finish and provide light to medium broom finish (across the direction of traffic) at all paving as approved by the Architect.
- C. SIDEWALKS: Provide light broom finish perpendicular to walk. Provide Architect with sample panel of proposed finish for approval prior to beginning work.
- D. STEPS AND RAMPS: Shall be constructed as detailed. Exterior steps, landings, and ramps shall be medium broom finished.
- E. PAVING JOINTS: Provide tooled eased edges along both sides of redwood joint form to ensure neat appearance, sealant adhesion, and to facilitate removal of top strip. Use 1/8" radius jointing tool.
- F. OPEN TOOLED JOINT: Provide scored lines on concrete sidewalks 5'-0" o.c. unless spaced otherwise on the drawings. Joint size shall be 1/4" wide x 1/4 depth of concrete.
- G. All concrete paving and walks shall be uniform in color and consistent in finish. Remove and replace any areas dimpled by rain or discolored (concrete mix).

3.6 CURING

- A. Apply complete covering of curing compound as soon as concrete is finished and in accordance with manufacturer's instructions. Curing compound shall be applied as it comes from the can, at the rate of 200 to 300 square feet per gallon.
- B. To avoid sealant adhesion problems ensure that curing compound does not seep into paving joints that receive sealant.

3.7 CAP SEALANT

- A. Remove redwood top strip from joint forms. Take care to avoid damaging concrete edges. Clean sealant cavity and inspect for proper depth as recommended by sealant manufacturer.
- B. Ensure that sealant cavity is clean, dry, and free of dust, dirt, and small stones. Ensure that edges are not contaminated with curing compound, oil or other agents, which might cause adhesion failure. Prime side walls in accordance with sealant manufacturer's recommendations.
- C. Install flat ethafoam strip in bottom of sealant cavity to provide bond-breaker at bottom of sealant and to ensure against sealant loss past the joint form. Install strip in thickness required to provide sealant cavity size as recommended by sealant manufacturer. Use no sand or other loose material in joint cavity.
- D. Mix sealant thoroughly in accordance with manufacturer's recommendations and pour to within 1/8" of top of paving. Where sealant must be repoured due to run off or improper level, remove completely all traces of sealant on side walls before next application.
- E. At concrete curbs rake joint filler to minimum 1" depth and install sealant manufacturer's vertical joint grade sealant.

3.8 CLEANING AND PROTECTION

- A. Paving is to be kept free of any foreign substances (wax, oil, paint, etc.) or surface irregularities, which may affect the final appearance of the completed installation.
- B. Unless otherwise approved by the Architect, no vehicular traffic will be allowed on any concrete slab, paving or drive until after the 7 day concrete tests have been made by the laboratory indicating that the concrete has attained 3,000 psi compressive strength.
- C. Contractor shall coordinate with Architect and Owner to determine a suitable on-site "wash-out" area for concrete trucks. Contractor shall be responsible for clean up of the designated area.

D. Contractor shall keep clean all adjacent public streets and rights of way. Wash down daily or more often as needed to maintain a safe condition at entrances/exits to site.

3.9 TESTING LABORATORY CONTROL

- A. Contractor shall contact Owner's Testing Laboratory at least 24 hours prior to time of anticipated concrete placement.
- B. Contractor shall require the manufacturers of the cement and metal reinforcement to be used in the work to furnish mill certificates showing that such materials meet ASTM standards as specified.
- C. Contractor shall follow all requirements of ASTM C 31 concerning the proper handling and protection of concrete test cylinders. Contractor shall provide locked storage facilities for test cylinders with all heat, insulation and protection as required by ASTM C 31.

SECTION 22 01 00 - SUMMARY OF PLUMBING WORK

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.

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.
 - 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:

3.2 Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.3 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.

3.4 No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

3.5 **PREPARATION**

- A. Demolition Requirements:
- 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.

3.6 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.

3.7 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.

3.8 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.

3.9 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.

3.10 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.

3.11 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.

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

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.
 - 2) Type Two Acceptable Products:
 - (1) Swivel Ring Hanger: Anvil Fig. 69.
 - (2) Insulation Protection Shield: Anvil Fig. 167.
 - (3) Equals by Cooper B-Line.

- 3) 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.
 - 4) 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.
 - 5) 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:

Ro	ods	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:
 - 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.

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):
 - 2. Water Heaters.

- 3. 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

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.

B. Related Requirements:

- 1. Section 22 1116: 'Domestic Water Piping'.
- 2. Section 22 1400: 'Facility Storm Drainage'.(if provided on plans)

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.

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		

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.
 - 1. 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:
 - 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.
 - 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.

3.6 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.
- B. 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.
- C. 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.

3.7 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.e.
 - 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.

3.8 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.

3.9 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.

3.10 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.

3.11 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: Refrigerant suction and hot-gas piping.
 - 1. Operating Temperature: 35 to 50 deg F
 - 2. Insulation Material: Flexible elastomeric.
 - 3. Insulation Thickness: 1" thick.
 - 4. Field-Applied Jacket: Aluminum Jacket on building exterior application only.
 - 5. Vapor Retarder Required: Yes.
 - 6. 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.

3.12 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.

B. Service: Refrigerant suction.

- 1. Operating Temperature: 35 to 50 deg F (2 to 10 deg C).
- 2. Insulation Material: Flexible elastomeric.
- 3. Insulation Thickness: Apply the following insulation thicknesses: $\frac{1}{2}$ "
- 4. Field-Applied Jacket: Aluminum
- 5. Vapor Retarder Required: Yes.
- 6. Finish: None.

SECTION 22 11 16 - DOMESTIC WATER PIPING

PART1-GENERAL

1.1 SUMMARY

- B. Includes But Not Limited To:
 - 3. Perform excavating and backfilling required by work of this Section.
 - 4. 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

- B. Provide components and installation capable of producing domestic water piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 3. Domestic Water Distribution Piping: 125 psig..

1.3 SUBMITTALS

- B. Action Submittals:
 - 3. Product Data: For pipe, tube, fittings, and couplings.
 - 4. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- C. Informational Submittals:
 - 3. Test And Evaluation Reports:
 - b. Written report of sterilization test.
- D. Shop Drawings:
 - b. Piping Layout:
 - 3) Provide as-built drawings at end of project.

1.4 QUALITY ASSURANCE

- B. Regulatory Agency Sustainability Approvals:
 - 3. 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.
 - 4. California only: California Assembly Bill 1953 (AB1953) Compliant for Lead Free.
- C. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- D. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic, potable domestic water piping and components.
- E. Comply with NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART2-PRODUCTS

2.1 **SYSTEMS**

- Β. Manufacturers:
 - Manufacturer Contact List: 3
 - Aquatherm, Inc., b.
 - Cash Acme, c.
 - d. Cla-Val Company,
 - e. Conbraco Industries Inc.
 - f. Hammond Valve,
 - Handy & Harmon Products Div, g.
 - h. Honeywell Inc.
 - Leonard Valve Co, i.
 - Milwaukee Valve Co, j.
 - k. Nibco Inc.
 - Rehau, 1.
 - Sloan Valve Co. m.
 - Spence Engineering Co, n.
 - Symmons Industries, Braintree, 0.
 - Uponor Inc. p.
 - Viega ProPress, Wic q.
 - Watts Regulator Co, r.
 - Wilkins (Zurn Wilkins), S
 - Zurn PEX, Inc. t
- C. Materials:
 - Design Criteria: 3.
 - All drinking water products, components, and materials above and below grade used in drinking water b. systems must meet NSF International Standards for Lead Free. c.
 - No CPVC allowed.
 - 4. Pipe: b.
 - Copper:
 - 3) Above-Grade:
 - a) Meet requirements of ASTM B88, Type K & L.
 - Hard Copper Tube: ASTM B 88, Types K and L, water tube, drawn tempered. b)
 - Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, c) 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.
 - Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with balle) 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.
 - Copper-Tubing, Keyed Couplings: Copper-tube dimensions and design similar to g) AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.
 - 4) Below-Grade:
 - Meet requirements of ASTM B88, Type K. 3/4 inch minimum under slabs. a)
 - 2 inches And Smaller: Annealed soft drawn. b)
 - 2-1/2 inches And Larger: Hard Drawn. c)
 - 5) Fittings:
 - a) For Copper Pipe: Wrought copper.
 - 5. Connections For Copper Pipe:
 - Above-Grade: b
 - 3) Sweat copper type with 95/5 or 96/4 Tin-Antimony solder, Bridgit solder, or Silvabrite 100 solder. Use only lead-free solder.

C.

- 4) Viega ProPress System
- Below Grade:
 - 3) Brazed using following type rods:
 - a) Copper to Copper Connections:
 - 2) AWS Classification BCuP-4 Copper Phosphorus (6 percent silver).
 - 3) AWS Classification BCuP-5 Copper Phosphorus (15 percent silver).
 - 4) Copper to Brass or Copper to Steel Connections: AWS Classification BAg-5 Silver (45 percent silver).
 - 5) Do not use rods containing Cadmium.
 - 6) Brazing Flux:

a)Approved Products:

- 1) Stay-Silv white brazing flux by Harris Product Group.
- 2) High quality silver solder flux by Handy & Harmon.
- 7) Joints under slabs acceptable only if allowed by local codes.
- 6. Ball Valves:
 - b. Use ball valves exclusively unless otherwise specified. Ball valves shall be by single manufacturer from approved list below.
 - c. Valves shall be two-piece, full port for 150 psi SWP.
 - 3) Operate with flow in either direction, suitable for throttling and tight shut-off.
 - 4) Body: Bronze, 150 psig wsp at 350 deg F and 400 psig wog.
 - 5) Seat: Bubble tight at 100 psig under water.
 - d. Class One Quality Standard: Nibco T585 or S585.
 - 3) Equal by Conbraco 'Apollo,' Hammond, Milwaukee, or Watts.
- 7. Combination Pressure Reducing Valve / Strainer:
 - b. Integral stainless steel strainer, or separate 'Y' strainer installed upstream of pressure reducing valve.
 - c. Built-in thermal expansion bypass check valve.
 - d. Class One Quality Standard: Watts LFU5B:
 - 3) Equal by Cash Acme, Cla-Val Hi Capacity, Conbraco 36C, Honeywell-Braukmann, Spence Hi Capacity, Watts, or Wilkins. See Section 01 6200.

PART3-EXECUTION

3.1 INSTALLATION

- B. Below Grade:
 - 3. Install piping under slabs without joints where possible.
 - 4. Insulate water piping buried within building perimeter.
 - 5. Bury water piping 6 inches minimum below bottom of slab and encase in 2 inches minimum of sand.
- C. Locate cold water lines a minimum of 6 inches from hot water line.

3.2 FIELD QUALITY CONTROL

- B. Field Tests:
 - 3. Before pipes are covered, test systems in presence of Architect/Engineer at 125 psig hydrostatic pressure for four (4) hours and show no leaks.
 - 4. Disconnect equipment not suitable for 125 psig pressure from piping system during test period.

3.3 ADJUSTING

- B. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - 3. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
 - 4. Adjust calibrated balancing valves to flows indicated.

3.4 CLEANING

- B. Clean and disinfect potable domestic water piping as follows:
 - 3. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
 - 4. 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:
 - b. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - c. Fill and isolate system according to either of the following:
 - 3) 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.
 - 4) 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.
 - d. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.
- E. 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.

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.
- B. 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.
 - 6. 2" and Smaller: Bronze body with brass ball, adjustment knob, calibrated nameplate, and threaded or solder-joint ends.
 - 7. 2" and Smaller: Bronze, Y-pattern body with adjustment knob and threaded ends.

- 8. 2.5" and Larger: Cast-iron, Y-pattern body with bronze disc and flanged or grooved ends.
- C. 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.
- D. 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, stainlesssteel 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

- A. 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:
- B. Manufacturers:
 - 1. Josam Co.
 - 2. MIFAB Manufacturing, Inc.
 - 3. Precision Plumbing Products, Inc.
 - 4. Smith, Jay R. Mfg. Co.
 - 5. 125-psig (860-kPa) minimum working pressure.
- 6. Bronze body with atmospheric-vented drain chamber.
- 7. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
- 8. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
- 9. 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.
- B. Manufacturers:
 - 1. Josam Co.
 - 2. Smith, Jay R. Mfg. Co.
 - 3. Tyler Pipe; Wade Div.
 - 4. Zurn Industries, Inc.; Specification Drainage Operation.
- C. 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.
- D. 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.
- E. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.
- F. 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.
- G. 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.
- H. 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.
- I. 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.
- J. 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.
- 3. 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.
 - 3. 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 floordrain 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.

SECTION 22 13 13 - FACILITY SANITARY SEWERS

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 PVC PIPING

A. PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.

- 1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.
- B. PVC Special Fittings: ASTM F 409, drainage-pattern tube and tubular fittings with ends as required for application.
- C. Plenum Vent Lines: In areas of building with a return air plenum.
 - 1. Approved Types:
 - a. Service weight, single-hub or no-hub type cast iron soil pipe meeting requirements of ASTM A74.
 - b. Vent lines 2-1/2 inches or smaller may be Schedule 40 galvanized steel.
 - c. Joint Material:
 - 1) Single-Hub: Rubber gaskets meeting requirements of ASTM C564.
 - 2) No-Hub Pipe: Neoprene gaskets with stainless steel cinch bands.
 - d. Fittings:
 - e. 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.

2.2 EXECUTION

2.3 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.

2.4 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.
 - 4. 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

2.5 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Conduct tests for leaks and defective work. Notify Architect before testing.
 - 2. Thermoplastic Pipe System:
 - a. Before backfilling and compacting of trenches, Fill waste and vent system with water to roof level or 10 feet minimum, and show no leaks for two hours. Correct leaks and defective work.
 - b. After backfilling and compacting of trenches is complete but before placing floor slab, re-test as specified above. Uncover pipe and correct leaks and defective work. Re-backfill and compact and re-test.
- 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.

2.6 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.

SECTION 22 13 19 - FACILITY SANITARY SEWER SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Products Furnished But Not Installed Under this Section as described in Contract Documents.
 - 1. Cleanouts.
 - 2. Floor drains.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Sanitary Waste and Vent Piping: 10-foot head of water.
 - 2. Storm Drainage Piping: 10-foot head of water.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:
 - 1. Cleanouts, floor drains, and roof drains.
 - 2. Roof flashing assemblies.
 - 3. Grease interceptors(if applicable)
 - 4. Sleeve penetration systems.

PART 2 - PRODUCTS

2.1 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.
 - a. Special Coating: Include corrosion-resistant interior coating on fittings for plastic chemical waste and vent stacks.

2.2 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.

2.3 CLEANOUTS

- A. Cleanouts: Comply with [ASME A112.36.2M] [ASME A112.3.1] < Insert other>.
 - 1. Application: [Floor cleanout] [Wall cleanout] [For installation in exposed piping].
 - 2. Products:
 - a. Josam Co.
 - b. Mifab
 - c. Smith, Jay R. Mfg. Co.
 - d. Tyler Pipe, Wade Div.
 - e. Zurn Industries, Inc., Specification Drainage Operation.

2.4 FLOOR DRAINS

- A. Floor Drains.
 - 1. Products:
 - a. Josam Co.
 - b. Mifab
 - c. Smith, Jay R. Mfg. Co.
 - d. Tyler Pipe, Wade Div.
 - e. Zurn Industries, Inc.
 - f.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install trap seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent and connect to floordrain body, trap, or inlet fitting. Adjust valve for proper flow.

- B. 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.
- C. Install expansion joints on vertical risers, stacks, and conductors if indicated.
- D. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 - 1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.
 - 3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
 - 4. Locate at base of each vertical soil and waste stack.
- E. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.
- F. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.
- G. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.
- H. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.
- I. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch (25-mm) clearance between vent pipe and roof substrate.
- J. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 - 1. Position floor drains for easy access and maintenance.
 - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
 - b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
 - c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.
 - 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 - 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- K. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.
 - 1. Install roof-drain flashing collar or flange so no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
 - 2. Position roof drains for easy access and maintenance.
- L. Install interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.
 - 1. Flush with In-Ground Installation: Set unit and extension, if required, with cover flush with finished grade.

- 2. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.
- M. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.
- N. Fasten recessed-type plumbing specialties to reinforcement built into walls.
- O. Install wood-blocking reinforcement for wall-mounting and recessed-type plumbing specialties.
- P. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

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 according to Division Sections.
- E. Interceptor Connections: Connect piping, flow-control fittings, and accessories.
 - 1. Grease Interceptors: Connect inlet and outlet to unit, and flow-control fitting and vent to unit inlet piping.

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:
 - 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.
- 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.

3.5 **PROTECTION**

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

SECTION 22 47 13 - ELECTRIC DRINKING FOUNTAINS

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.

SECTION 23 01 00 - SUMMARY OF MECHANICAL WORK

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. <u>HVAC</u>: Provide all materials and labor associated with a complete operational installation of new HVAC systems including, but not limited to:
 - DX Split System A/C Units
 - Exhaust fans
 - Sheet metal, Ductwork
 - Diffusers and Grilles
 - Duct accessories, including grilles, and louvers
 - Air Test and Balance

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.

SECTION 23 05 10 - BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1.2 SUMMARY

- A. This Section includes the following basic mechanical materials and methods to complement other Sections.
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Concrete base construction requirements.
 - 3. Escutcheons.
 - 4. Dielectric fittings.
 - 5. Flexible connectors.
 - 6. Mechanical sleeve seals.
 - 7. Equipment nameplate data requirements.
 - 8. Nonshrink grout for equipment installations.
 - 9. Field-fabricated metal and wood equipment supports.
 - 10. Installation requirements common to equipment specification sections.
 - 11. Cutting and patching.
 - 12. Touchup painting and finishing.

1.3 DEFINITIONS

- A. 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, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. 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 shelters.
- F. The following are industry abbreviations for plastic materials:
- G. PVC: Polyvinyl chloride plastic.
- H. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene propylene diene terpolymer rubber.

1.4 SUBMITTALS

- A. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.
- B. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
 - 1. Planned piping layout, including valve and specialty locations and valve-stem movement.
 - 2. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
 - 3. Sizes and location of required concrete pads and bases.
 - 4. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
 - 5. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.

1.5 QUALITY ASSURANCE

- A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
- B. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.
- B. Protect stored pipes, ductwork, equipment, and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
- C. Protect flanges, fittings, and piping specialties from moisture and dirt.
- D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

- F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in architectural section.
- G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

1.8 OPERATION PRIOR TO ACCEPTANCE

- A. When any equipment is operable, and it is to the advantage of the Contractor to operate the equipment, he may do so provided that he properly supervises the operation, and retains full responsibility for the equipment operated.
- B. Regardless of whether or not the equipment has or has not been operated, the Contractor shall clean the equipment properly, make required adjustments, and complete punch list items before final acceptance by the Owner.
- C. The date of acceptance by the Engineer, for beneficial use by the Owner, shall be the beginning date of the warranty period.

1.9 SPACE AND EQUIPMENT ARRANGEMENT

- A. The size of each item of mechanical equipment shown on the Drawings is based on the dimensions of a particular manufacturer as indicated. While other manufacturers may be acceptable, it shall be the responsibility of the Contractor to determine whether or not the equipment he proposes to furnish will fit into the space. Shop drawings shall be prepared when required by the engineer to indicate a suitable arrangement.
- B. Install equipment in a manner to permit access to all surfaces. Install valves, motors, drives, lubricating devices, filters, and other accessory items in a position to allow removal for service without requiring the disassembly of another part.
- C. Provide access panels acceptable to the Engineer for equipment that is concealed above ceiling space.
- D. Large equipment assemblies or components which will be installed in the building, and which are too large to permit access through doorways, stairways or shafts, shall be brought to the site and placed in the appropriate spaces before the enclosing structure is completed. Provisions shall be implemented by the Contractor to insure that the equipment will not be damaged in any way during the associated construction procedures.

1.10 START-UP OF EQUIPMENT AND SYSTEMS

- A. Whenever the manufacturer of a particular item of equipment or a particular system makes available a start-up service after completion of the installation, such manufacturer's start-up service (rendered by the manufacturer or his authorized representative) shall be provided.
- B. Witnessing and explanations of start-up services shall be included as part of the "Instruction of Owner's Personnel" as specified below.

1.11 INSTRUCTION OF OWNER'S PERSONNEL

- A. Provide the services of competent engineers or technicians acceptable to the Engineer to instruct representatives of the Owner in complete and detailed operation and maintenance of each item of equipment, and each system. These instructions shall be provided for whatever periods may be necessary to accomplish the desired results. Upon completion of these instructions, the Contractor shall obtain a letter of release, acknowledged by the Owner or his authorized representative, stating the dates on which the various kinds of instruction were given, and the personnel to whom the instructions were given.
- B. The Contractor shall be fully responsible for proper maintenance of equipment and systems until the instructions have been given to the Owner's personnel and the letter of release acknowledged.
- C. In providing the instructions to the Owner's personnel, the written operating and maintenance manuals shall be followed in all instances, and the Owner's personnel shall be familiarized with such manuals. Operating and maintenance manuals used for instructions shall include piping diagrams, valve identification charts, control and interlocking wiring diagrams, manufacturers' operation and maintenance manuals, parts lists (with sources identified), and other data as appropriate for each system, and as required elsewhere in the Specifications to be furnished to the Owner prior to final acceptance of the project.
- D. Provide the Owner with three (3) complete sets of all maintenance manuals, pamphlets, brochures or instructions. This material shall be catalogued, indexed and bound into books.

1.12 ACCEPTABLE MANUFACTURERS

A. A. Provide equipment and materials from listed manufacturers listed within this specification. Deviations from this specification will not be acceptable. When one manufacturer is listed, alternate materials and equipment may be provided "equal to" the listed. When more than one manufacturer is listed, equipment and material must be provided by one of the listed manufacturers.

PART 2 - PRODUCTS

2.1 STANDARD PRODUCTS

- A. Each item of equipment furnished under this Division of the Specifications shall be essentially the standard product of the manufacturer. Where two or more units of the same kind or class of equipment are required, these shall be the products of a single manufacturer; however, the component parts of the equipment need not be the products of one manufacturer.
- B. Materials and equipment shall be of the base quality normally used in good commercial practice, and shall be the products of reputable domestic manufacturers unless otherwise specified. Each major component shall bear a nameplate giving the name and address of the manufacturer, and the catalog number or designation of the component.

2.2 QUALITY AND CLASSIFICATION OF MATERIALS

- A. Materials and equipment shall be new and of the quality specified, and shall be free from defects at the time of installation. Materials or equipment damaged in shipment or otherwise damaged prior to installation shall not be repaired at the job site, but shall be replaced with new materials or equipment identical with those damaged.
- B. Wherever a UL standard has been established for a particular type of material or equipment, each such material or equipment provided on this project shall meet the requirements of the UL standard in every way and shall be UL listed and labeled.

2.3 LOCAL PARTS AND SERVICE

A. Each item of equipment furnished on this project shall have local representation, factory-authorized service, and an adequate stock of repair parts. "Local" shall be defined, for this purpose, as "within 50 miles of the project site."

2.4 FLAME SPREAD PROPERTIES OF MATERIALS

A. Materials used for insulation, acoustical linings, adhesives, jackets and coatings, and combinations of these materials, shall each have a flame spread rating of 25 or less, and a smoke developed rating of 50 or less, as determined by an independent testing laboratory in accordance with NFPA-255.

2.5 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Dielectric Unions:
 - a. Watts Industries, Inc.; Water Products Div.
 - b. Zurn Industries, Inc.; Wilkins Div.
 - 2. Mechanical Sleeve Seals:
 - a. Calpico, Inc.
 - b. Metraflex Co.
 - c. Thunderline/Link-Seal.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.7 PIPING SPECIALTIES

- A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
 - 1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
 - 2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
 - 3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
 - 4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - a. Underdeck Clamp: Clamping ring with set screws.
- B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
 - 1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
 - 2. OD: Completely cover opening.
 - 3. Cast Brass: One piece, with set screw.
 - a. Finish: Rough brass.
 - b. Finish: Polished chrome-plate.
 - 4. Cast-Iron Floor Plate: One-piece casting.

2.8 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
 - 1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psig, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: 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.
- C. Install piping at indicated slope.
- D. Install components with pressure rating equal to or greater than system operating pressure.
- E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping free of sags and bends.

- G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- I. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. Install fittings for changes in direction and branch connections.
- L. Install couplings according to manufacturer's written instructions.
- M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
 - 1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish.
 - 2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
 - 3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
 - 4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
 - 5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.
- N. Sleeves are not required for core drilled holes.
- O. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.
- P. 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. Build sleeves into new walls and slabs as work progresses.
 - 3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
 - b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
 - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants.
 - 5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.
- Q. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe or pipe insulation and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
 - 3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- R. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

- 1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials.
- T. Verify final equipment locations for roughing-in.
- U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- V. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
 - 1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 - 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 - 3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
 - 4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 5. 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:
 - a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
 - b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
 - c. Align threads at point of assembly.
 - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
 - e. 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.
 - 6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
 - 7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
 - 8. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:
 - a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - b. PVC Nonpressure Piping: ASTM D 2855.
 - c. PVC to ABS Nonpressure Transition Fittings: Procedure and solvent cement according to ASTM D 3138.
 - 9. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657 procedures and manufacturer's written instructions.
 - a. Plain-End Pipe and Fittings: Use butt fusion.
 - b. Plain-End Pipe and Socket Fittings: Use socket fusion.
- W. Piping Connections: Make connections according to the following, unless otherwise indicated:

- 1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
- 2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
- 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.

3.2 EQUIPMENT AND MATERIAL INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment and material to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- E. Install equipment and ductwork giving right of way to piping installed at required slope.
- F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

3.3 PAINTING AND FINISHING

- A. Refer to paint materials, surface preparation, and application of paint.
- B. Do not paint piping specialties with factory-applied finish.
- C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psig, 28-day compressive-strength concrete and reinforcement or as specified.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.6 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

3.7 GROUTING

- A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.
- B. Clean surfaces that will come into contact with grout.

- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placing of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases to provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout according to manufacturer's written instructions.

SECTION 23 05 29 - HANGERS AND SUPPORTS

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:
 - 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.
 - 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.
 - 3. Pipes NPS 8 and Larger: Include wood inserts.
 - 4. 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.

SECTION 23 05 30 - SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Pipe, and equipment hangers, supports and associated anchors.
- B. Sleeves and seals.
- C. Flashing and sealing equipment and pipe stacks.

1.2 SUBMITTALS

- D. Submit shop drawings and product data under provisions of specification.
- E. Indicate hanger and support framing and attachment methods.

PART 2 - PRODUCTS

2.1 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.

2.2 HANGER RODS

A. Galvanized Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.3 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.

2.4 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.

2.5 EQUIPMENT CURBS

A. Fabricate curbs of hot dipped galvanized steel.

2.6 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.

2.7 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.

2.8 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

3.1 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.

3.2 PIPE HANGERS AND SUPPORTS

E. Support horizontal piping as follows:

<u>PIPE SIZE</u>	<u>MAX.</u> <u>HANGER</u> <u>SPACING</u>	<u>HANGER</u> <u>DIAMETER</u>
(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"

New Restroom Buildings at Edinburg Municipal Park and Dr. Diaz Park

8 to 10 inch	10'-0"	5/8"
0 to 10 men	10 0	5/0
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"
	41.01	1 (0)
6 to 8 inch	4'-0"	1/2"
10 and over	4'-0"	5/8"

- F. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- G. Place a hanger within 12 inches of each horizontal elbow and at the vertical horizontal transition.
- H. D. Use hangers with 1-1/2 inch minimum vertical adjustment.
- I. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- J. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- K. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- L. Support riser piping independently of connected horizontal piping.
- M. Install hangers with nut at base and above hanger; tighten upper nut to hanger after final installation adjustments.
- N. Portable pipe hanger systems shall be installed per manufacturers' instructions.
- O. Distances between supports are maximum distance. Supports shall be provided to carry the pipe/equipment load.

3.3 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:

<u>NPS</u>	<u>LENGTH</u>	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.

3.4 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.

3.5 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.

3.6 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.
SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING

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 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.

1.2 **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.

1.3 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.

1.4 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.

1.5 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.

1.6 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.

1.7 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 specifications.
- 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 equipment for installation and for properly operating safety interlocks and controls.
- M. 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. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
- 5. Sensors are located to sense only the intended conditions.
- 6. Sequence of operation for control modes is according to the Contract Documents.
- 7. 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.
- 8. Interlocked systems are operating.
- 9. Changeover from heating to cooling mode occurs according to design values.
- N. 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. Automatic temperature-control systems are operational.
 - 3. Equipment and duct access doors are securely closed.
 - 4. Balance, fire dampers are open.
 - 5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - 6. 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 supplyfan 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.
 - 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 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.

3.7 CONDENSING UNITS

A. Verify proper rotation of fans and measure entering- and leaving-air temperatures. Record compressor data.

3.8 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.

3.9 TEMPERATURE TESTING

- A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperaturecontrol system.
- B. Measure outside-air, wet- and dry-bulb temperatures.

3.10 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 waterflow 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.

3.11 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.

3.12 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. Fan curves.
 - 2. Manufacturers' test data.
 - 3. Field test reports prepared by system and equipment installers.
 - 4. 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. Roof Top 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.
 - 1. Discharge air temperature
- G. Electric-Coil Test Reports: For electric duct coils, and electric 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 (kW).
 - e. Number of stages.
 - f. Connected volts, phase, and hertz.
 - g. Rated amperage.
 - h. Discharge air temperature

- 2. Test Data: Include design and actual values for the following:
 - a. Heat output in Btuh (kW).
 - 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).
 - f. Voltage at each connection.
 - g. Amperage for each phase.
- 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. Condenser Reports: For refrigerant side of unitary systems, stand-alone refrigerant compressors, air-cooled condensing units, include the following:
 - 1. Unit Data: Include the following:

a. Unit identification. TESTING AND BALANCING

- b. Location.
- c. Unit make and model number.
- d. Manufacturer's compressor serial numbers.
- e. Compressor make.
- f. Compressor model and serial numbers.
- g. Refrigerant weight in lb (kg).
- 2. Test Data: Include design and actual values for the following:
 - a. Entering-air, dry-bulb temperature in deg F (deg C).
 - b. Leaving-air, dry-bulb temperature in deg F (deg C).
 - c. Control settings.
 - d. Unloader set points.
 - e. Low-pressure-cutout set point in psig (kPa).
 - f. High-pressure-cutout set point in psig (kPa).
 - g. Suction pressure in psig (kPa).
 - h. Suction temperature in deg F (deg C).
 - i. Condenser refrigerant pressure in psig (kPa).
 - j. Condenser refrigerant temperature in deg F (deg C).
 - k. Oil pressure in psig (kPa).
 - 1. Oil temperature in deg F (deg C).
 - m. Voltage at each connection.
 - n. Amperage for each phase.
 - o. The kW input.
 - p. Number of fans.

3.13 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.

SECTION 23 06 01 - MECHANICAL IDENTIFICATION

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.

4/3/2019

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.
 - 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.
 - 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.
 - 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.
- C. Valve-Tag Color:
 - a. Cold Water: Green.
 - b. Hot Water: Yellow.
 - c. Fire Protection: Red.
 - 2. 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.

3.8 CLEANING

A. Clean faces of mechanical identification devices and glass frames of valve schedules.

SECTION 23 26 00 - CONDENSATE DRAIN PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Coordinate installation of condensate drain piping with Section 22 0501 as described in Contract Documents.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM B88-09, 'Standard Specification for Seamless Copper Water Tube'.
 - b. ASTM D1785-12, 'Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120'.

PART 2 - PRODUCTS

2.1 SYSTEMS

- A. Materials:
 - 1. Condensate Drains:
 - a. Exterior And Interior Lines: Type M copper meeting requirements of ASTM B88.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Condensate Drains:
 - 1. Support piping and protect from damage.

SECTION 23 31 13 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions.

1.2 SUMMARY

B. 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 RANGE HOOD EXHAUST DUCT INSTALLATIONS

- A. Install ducts to allow for thermal expansion of ductwork through 2000 deg F temperature range.
- B. Install ducts without dips or traps that may collect residues, unless traps have continuous or automatic residue removal.
- C. Install access openings at each change in direction and at 15-foot intervals; locate on sides of duct a minimum of 1-1/2 inches from bottom; and fit with grease-tight covers of same material as duct.
- D. Do not penetrate fire-rated assemblies.

3.4 DISHWASHER EXHAUST DUCT INSTALLATIONS

A. Install dishwasher exhaust ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

3.5 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.

3.6 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."

3.7 DUCT APPLICATION

- A. Service: Round and rectangular, supply/return/outside -air ducts, concealed.
- B. Sheet-metal with wrap insulation
- C. 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.

3.8 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.

3.9 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect the system.

SECTION 23 34 23 - CENTRIFUGAL FANS

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

CENTRIFUGAL FANS

- 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.
 - 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, L50 of 200,000 hours.
 - 2. Roller-Bearing Rating Life: ABMA 11, L₅₀ 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.

SECTION 26 01 00 - SUMMARY OF ELECTRICAL WORK

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, fire alarm, rough-in for telephone and data system, 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. 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.

SECTION 26 01 10 - BASIC ELECTRICAL MATERIALS AND METHODS

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. Raceways.
 - 2. Building wire and connectors.
 - 3. Supporting devices for electrical components.
 - 4. Electrical identification.
 - 5. Electricity-metering components.
 - 6. Concrete equipment bases.
 - 7. Electrical demolition.
 - 8. Cutting and patching for electrical construction.
 - 9. Touchup painting.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. IMC: Intermediate metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

- A. Product Data: For electricity-metering equipment.
- B. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

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 NFPA 70.

1.6 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
 - 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- C. Coordinate electrical service connections to components furnished by utility companies.
 - 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
 - 2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.
- D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Section "Access Doors."
- E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.1 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

- A. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.
- B. Meter Sockets: Comply with requirements of electrical power utility company.
- C. Modular Meter Centers: Factory-coordinated assembly of a main meter center circuit-breaker unit with wireways, tenant meter socket modules, and tenant branch circuit breakers arranged in adjacent vertical sections, complete with interconnecting buses.
 - 1. Housing: NEMA 250, Type 3R enclosure.
 - 2. Tenant Branch Circuit Breakers: Series combination rated to protect circuit breakers in downstream panelboards that have 10,000-A interrupting capacity,
 - 3. minimum.

2.2 CONCRETE BASES

- A. Concrete Forms and Reinforcement Materials: As specified in Section "Cast-in-Place Concrete."
- B. Concrete: 3000-psi (20.7-MPa), 28-day compressive strength as specified in Section "Cast-in-Place Concrete."

2.3 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

BASIC ELECTRICAL MATERIALS AND METHODS 4/3/2019

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 RACEWAY AND CABLE INSTALLATION

- A. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.
- B. Install raceways and cables at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.
- C. Use temporary raceway caps to prevent foreign matter from entering.
- D. Make conduit 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.
- E. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.
- F. Install raceways embedded in slabs 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. Install conduit larger than 1-inch trade size (DN27) parallel to or at right angles to main reinforcement. Where conduit is 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.
 - 5. Make bends in exposed 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 exposed parallel raceways.
- G. 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.
- H. Install telephone and signal system raceways, 2-inch trade size (DN53) and smaller, 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, in addition to requirements above.
- I. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inch (1830-mm) flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.
- J. Set floor boxes level and trim after installation to fit flush to finished floor surface.

3.3 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

- B. Dry Locations: Steel materials.
- C. Support Clamps for PVC Raceways: Click-type clamp system.
- D. Selection of Supports: Comply with manufacturer's written instructions.
- E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.4 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
- E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- F. Install 1/4-inch- (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.
- G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch (38-mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- I. Simultaneously install vertical conductor supports with conductors.
- J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.
- K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
- L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
 - 1. Wood: Fasten with wood screws or screw-type nails.
 - 2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
 - 3. New Concrete: Concrete inserts with machine screws and bolts.
 - 4. Existing Concrete: Expansion bolts.
 - 5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
 - 6. Steel: Welded threaded studs or spring-tension clamps on steel.
 - a. Field Welding: Comply with AWS D1.1.

- 7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
- 8. Light Steel: Sheet-metal screws.
- 9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.5 IDENTIFICATION MATERIALS AND DEVICES

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Identify raceways and cables with color banding as follows:
 - 1. Bands: Pretensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches (51 mm) wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
 - 2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (8-m) maximum intervals in congested areas.
 - 3. Colors: As follows:
 - a. Fire Alarm System: Red.
 - b. Security System: Blue and yellow.
 - c. Telecommunication System: Green and yellow.
- E. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- F. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches (150 to 200 mm) below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm), overall, use a single line marker.
- G. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
 - 1. Phase A: Black.
 - 2. Phase B: Red.
 - 3. Phase C: Blue.
 - 4. Neutral: White.
 - 5. Ground: Green.
- H. Color-code 480/277-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
 - 1. Phase A: BROWN.
 - 2. Phase B: ORANGE.
 - 3. Phase C: YELLOW.

- 4. Neutral: White with a colored stripe or gray.
- 5. Ground: Green.
- I. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
- J. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- (9-mm-) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.6 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.7 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Section "Firestopping."

3.8 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Section "Cast-in-Place Concrete."

3.9 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.10 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
 - 1. Raceways.
 - 2. Building wire and connectors.
 - 3. Supporting devices for electrical components.
 - 4. Electrical identification.
 - 5. Electricity-metering components.
 - 6. Concrete bases.
 - 7. Electrical demolition.
 - 8. Cutting and patching for electrical construction.
 - 9. Touchup painting.
- B. Test Owner's electricity-metering installation for proper operation, accuracy, and usability of output data.

- 1. Connect a load of known kW rating, 1.5 kW minimum, to a circuit supplied by the metered feeder.
- 2. Turn off circuits supplied by the metered feeder and secure them in the "off" condition.
- 3. Run the test load continuously for eight hours, minimum, or longer to obtain a measurable meter indication. Use a test load placement and setting that ensure continuous, safe operation.
- 4. Check and record meter reading at end of test period and compare with actual electricity used based on test load rating, duration of test, and sample measurements of supply voltage at the test load connection. Record test results.
- 5. Repair or replace malfunctioning metering equipment or correct test setup; then retest. Repeat for each meter in installation until proper operation of entire system is verified.

3.11 REFINISHING AND TOUCHUP PAINTING

- A. Refinish and touch up paint. Paint materials and application requirements are specified in Section "Painting."
 - 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
 - 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
 - 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.12 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

SECTION 26 01 20 - BASIC ELECTRICAL REQUIREMENTS

PART1- GENERAL

1.1 RELATED REQUIREMENTS

- A. The General Provisions, Supplemental General Provisions, Special Provisions, Specification Sections and all relevant documents shall form a part of this Section of the Specifications, and shall be incorporated in this Section and each Section 260000 hereinafter as if repeated verbatim herein. All conditions imposed by these documents shall be applicable to all portions of the work under this Section. Certain specific paragraphs of said references may be referred to hereinafter in this Section. These references are intended to point out specific items to the Contractor, but in no way relieve him of the responsibility of reading and complying with all relevant parts of the entire Specification.
- B. The Contractor shall examine and coordinate with all Contract Drawings and Specifications, and all Addenda issued. Failure to comply shall not relieve him of responsibility. The omission of details of other portions of the work from this Section shall not be used as a basis for a request for additional compensation.
- C. The specific features and details for other portions of the work related to the construction in progress or to the adjacent building shall be determined by examination at the site.

1.2 SCOPE OF WORK

- A. The requirements contained in this Section apply to all work performed under these Specifications.
- B. The work covered by this Section of the Specifications comprises the furnishing of labor, material, equipment, transportation, tools and services, and performing operations required for, and reasonably incidental to, the installation of the work in accordance with the applicable Contract Documents, and subject to the terms and conditions of the Contract.
- C. Refer to other Sections of the Specifications for related work.

1.3 DEFINITION OF "CONTRACTOR"

- A. Where the word "Contractor" is used under any Section of this Section of the Specifications, it shall mean the Contractor engaged to execute the work included under that Section, even though this Contractor may be technically described as a Subcontractor, or an authorized representative.
- B. If the Contractor, engaged to execute a portion of the work, employs a Subcontractor to perform some of that work, he shall be completely responsible for the proper execution of this Subcontractor's work, in full conformity with the Contract Documents.

1.4 RESPONSIBILITY OF THE CONTRACTOR

- A. The Contractor shall be responsible for all work of every description in connection with this Section of the Specifications. The Contractor shall specifically and distinctly assume, and does so assume, all risk for damage or injury from whatever cause to property or person used or employed on or in connection with this work and of all damages or injury to any person or property wherever located, resulting from an action or operation under the Contract in connection with the work, and undertake the responsibility to defend the Owner against all claims on account of any such damage or injury.
- B. The Contractor will be held responsible for the satisfactory execution and completion of the work in accordance with the true intent of the Contract Documents. The Contractor shall provide without extra charge all incidental items required as part of the work, even though it may not be specifically indicated. If the Contractor has reason for objecting to the use of any material, equipment, device or method of construction as indicated, the Contractor shall make report of such objections to the Owner's Representative, obtain proper approval and adjustment to the Contract, and shall proceed with the work.

1.5 TERMINOLOGY

A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and similar phrases occur, it is the intent that the materials, equipment and devices described be furnished, installed and connected under this Section, complete for operation, unless specifically noted to the contrary.

- B. It is also the intent, unless specifically noted to the contrary, that all materials, equipment and devices described and specified under this Section of the Specifications be similarly furnished, installed and connected under this Section, whether or not a phrase as described in the preceding paragraph has been actually included.
- C. Whenever the words "Owner's Representative" occurs, it is intended to refer to the Architect, Engineer and/or specific Owner's Representative responsible for or capable of providing the necessary direction pertaining to the referenced issue.

1.6 ORDINANCES, PERMITS AND CODES

- A. It shall be the Contractor's duty to perform the work and provide the materials covered by these specifications in conformance with all ordinances and regulations of all authorities having jurisdiction.
- B. All work herein shall conform to all applicable laws, ordinances and regulations of the local utility companies.
- C. The Contractor shall obtain and pay for all permit and connection fees as required for the complete installation of the specified systems, equipment, devices and materials.
- D. The Contractor shall obtain permits, plan checks, inspections and approvals applicable to the work as required by the regulatory authorities. Fees and costs of any nature whatsoever incidental to these permits, inspections and approvals shall be assumed and paid by the Contractor. The pro-rata costs, if any, for utilities serving this property will be paid for by the Owner and shall not be included as part of this Contract.
- E. The work shall be in accordance with, but shall not be limited to, the requirements of:
 - 1 National Fire Protection Association
 - 2 National Electrical Code
 - 3 National Safety Code
 - 4 State of Texas Safety Code
 - 5 Local City Building Codes
 - 6 State of Texas Building Codes
- F. Codes and standards referred to are minimum standards. Where the requirements of the Drawings or Specifications exceed those of the codes and regulations, the Drawings and Specifications govern.

1.7 MATERIALS, EQUIPMENT AND DEVICE DESCRIPTION

- A. Materials, equipment and devices shall be of the best quality customarily applied in quality commercial practice, and shall be the products of reputable manufacturers. Each major component shall bear a nameplate giving the name and address of the manufacturer, and the catalog number or designation of the component.
- B. Materials, equipment and devices furnished under this Section of the Specifications shall be essentially the standard product of the specified manufacturer, or where allowed, an alternate manufacturer. Where two or more units of the same kind or class of a specific item are required, these shall be the products of a single manufacturer; however, the component parts of the item need not be the products of one manufacturer.
- C. In describing the various materials, equipment and devices, in general each item will be described singularly, even though there may be a multiplicity of identical items. Also, where the description is only general in nature, exact sizes, duties, space arrangements, horsepower requirements and other data shall be determined by reference to the Contract Documents.
- D. Space allocations for materials, equipment and devices have been made on the basis of present and known future requirements and the dimensions of items of equipment or devices of a particular manufacturer whether indicated or not. The Contractor shall verify that all materials, equipment and devices proposed for use on this project are within the constraints of the allocated space.

1.8 QUALITY ASSURANCE

A. Materials, equipment and devices shall be new and of the quality specified, and shall be free from defects at the time of installation. Materials, equipment and devices damaged in shipment or otherwise damaged or found defective prior to acceptance by the Owner shall not be repaired at the job site, but shall be replaced with new materials, equipment or devices identical with
those damaged, unless specifically approved otherwise by the Owner's Representative.

B. Wherever a UL standard has been established for a particular type of material, equipment or device, each item of such material, equipment or device provided on this project shall meet the requirements of the UL standard in every way, and shall be UL listed and labeled.

1.9 REFERENCE STANDARDS

- A. Materials, equipment, devices and workmanship shall comply with applicable local, county, state and national codes, laws and ordinances, utility company regulations and industry standards.
- B. In case of differences between building codes, state laws, local ordinances, industry standards, utility company regulations and the Contract Documents, the most stringent shall govern. The Contractor shall promptly notify the Owner's Representative in writing of any such difference. Should the Contractor perform any work that does not comply with local codes, laws and ordinances, industry standards or other governing regulations, the work shall be corrected of noncompliance deficiencies with the Contractor bearing all costs.
- C. In addition to the aforementioned ordinances, industry standards published by the following organizations shall apply:

AABM	-	American Association of Battery Manufacturers
ADA	-	American's with Disabilities Act
AIA	-	American Institute of Architects
ANSI	-	American National Standards Institute
ASTM	-	American Society for Testing and Materials
CBM	-	Certified Ballast Manufacturers Association
ETL	-	Electrical Testing Laboratories
FM	-	Factory Mutual
ICEA	-	Insulated Cable Engineers Associated
IEEE	-	Institute of Electrical and Electronic Engineers
IES	-	Illuminating Engineering Society
IRI	-	Industrial Risk Insurance
NBS	-	National Bureau of Standards
NEC	-	National Electrical Code
NECA	-	National Electrical Contractors Association
NEMA	-	National Electrical Manufacturers Association
NESC	-	National Electrical Safety Code
NETA	-	National Electrical Testing Association
NFPA	-	National Fire Protection Association
UL	-	Underwriters Laboratories

1.10 DRAWINGS AND SPECIFICATIONS

- A. The interrelation of the Drawings (including the schedules) and the Specifications are as follows:
 - 1 The Drawings establish quantities, locations, dimensions and details of materials, equipment and devices. The schedules on the Drawings indicate the capacities, characteristics and components.

- 2 The Specifications provide written requirements for the quality, standard and nature of the materials, equipment, devices and construction systems.
- B. The Drawings and Specifications shall be considered as being compatible; therefore, the work called for by one and not by the other shall be furnished and installed as though called for by both. Resolution of conflicts between Drawings and Specifications shall be as follows:
 - 1 If the Drawings and Specifications disagree in themselves, or with each other, the Contractor's pricing shall be based on furnishing and installing the most expensive combination of quality and quantity of work indicated for a complete operable system. Contractor is responsible to notifying the Architect and Engineer. In the event of this type of disagreement, the resolution shall be determined by the Owner's Representative. The contractor shall assume for an operable system at the most expensive combination as per the latest National Electrical Code. The contractor shall review all drawings and specifications prior to bid date.
 - 2 The Contractor shall be responsible for bringing any conflicts in the Drawings and the Specifications to the attention of the Owner's Representative immediately, prior to bid date.
 - 3 In general, if there is conflict between the Drawings and Specifications, the Drawings shall govern the Specifications.
 - 4 Where the Specifications do not fully agree with schedules on the Drawings, the schedules shall govern. Actual numerical dimensions indicated on the Drawings govern scale measurements and large scale details govern small scale drawings.
 - 5 Materials, equipment and devices called for on the Drawings and not indicated herein, shall be completely provided and installed as though it were fully described herein.
 - 6 Materials, equipment and devices called for herein shall be completely provided and installed, whether or not it is fully detailed, scheduled or indicated on the Drawings.
- C. The Contractor shall examine the Drawings and Specifications of the other portions of the work for fixtures and finishes in connection with this work. The Contractor shall carefully examine the Drawings to determine the general construction conditions, and shall familiarize himself with all limitations caused by such conditions.
- D. When discrepancies exist between scale and dimension, or between the Drawings of the various portions of the work, they shall be called to the attention of the Owner's Representative for further instruction, whose instructions shall be final and binding and work promptly resumed without any additional cost to the Owner.
- E. Review the construction details of the building(s) as illustrated on the Drawings of the other portions of the work, i.e., architectural, structural, civil, landscape, etc., and be guided thereby. Route conduits and set all boxes as required by the pace of the general construction.
- F. The Drawings diagrammatically show the sizes and locations of the various equipment and devices, and the sizes of the major interconnecting wires, without showing exact details as to elevations, offsets, control wiring and other installation requirements. Carefully layout the work at the site to conform to the architectural and structural conditions, to avoid obstructions and to permit proper grading of pipe associated with other portions of the work. 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. Make minor relocations necessitated by the conditions at the site, or directed by the Owner's Representative, without additional cost to the Owner.
- G. The Drawings and Specifications are intended to describe and illustrate systems which will not interfere with the structure of the building(s), fit into the available spaces, and insure complete and satisfactory operating installations. Prepare installation drawings as required for all critical areas illustrating the installation of the work in this Section as related to the work of all other Sections and correct all interferences with the other portions of the work or with the building structures before the work proceeds.
- H. The Drawings do not indicate the existing electrical installations other than to identify modifications or extensions thereto. Visit the site and ascertain the conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work. Failure to comply with this shall not constitute grounds for any additional payment in connection with

removing or modifying any part of the existing installation or installing any new or temporary work under this Section.

1.11 SUBMITTALS

- A. Submit product data and shop drawings in accordance with the Specifications.
- B. Process product data and shop drawings to insure that the proposed materials, equipment and devices conform to the requirements of the Contract Documents, and that there are no omissions or duplications. Provide layouts, fabrication information and data for systems, materials, equipment and devices proposed for the project.
- C. Submittals shall be provided for review and approval on all systems, equipment, devices and materials proposed for use on this project. Submittals shall include, but not be limited to, the following:
 - 1 Lighting and Appliance Panelboards
 - 2 Disconnect Switches
 - 3 Circuit Breakers and Fuses
 - 4 Materials: conduit, conductors, connectors, supports, etc.
 - 5 Lighting Fixtures, Lamps and Control Systems/Devices
 - 6 Wiring Devices
 - 7 Transformers
 - 8 Distribution Panelboards
 - 9 Motor Control Center
 - 10 As indicated on each submittal section
- D. The product data shall not consist of manufacturer's catalogs or cut sheets that contain no indication of the exact item offered. The submission on individual items shall designate the exact item offered.
- E. Do not submit detailed quantitative listings of materials, equipment and devices. It is the Contractor's responsibility to provide proper sizes and quantities to conform to Contract Documents.
- F. Assemble submittals on related items procured from a single manufacturer in bound brochures or other suitable package form, rather than submitting a multiplicity of loose sheets.
- G. Prepare shop drawings whenever equipment proposed varies in physical size and arrangement from that indicated thus causing rearrangement of equipment space, where tight spaces require extreme coordination between this work and other work, where called for elsewhere in these Specifications and where specifically requested by the Owner's Representative. Shop drawings shall be prepared at a scale of not less than 1/4 inch equals 1 foot.
- H. The Contractor shall sign the submittal as an indication of compliance with the Contract Documents. If there are any deviations from the Contract Documents, he shall so indicate on the submittal. Any deviations not so indicated shall be cause for rejection and removal of the non-complying equipment at the Contractor's expense.

1.12 SUBSTITUTIONS

- A. Where a single manufacturer is mentioned by trade name or manufacturer's name, unless specifically noted otherwise, it is the only manufacturer that will be accepted.
- B. Where multiple manufacturers are listed, none other than those manufacturers will be accepted.
- C. Manufacturers not listed will be considered for substitution prior to bid only. The substitute manufacturer shall submit a complete copy of the appropriate technical specification section minimum seven (7) business days prior to bid with each sub-paragraph noted with the comment, "compliance", "deviation", "alternate" or "not applicable". In the case of non-primary, vendor-supplied items, the name of the sub-vendor supplying said item, including model number, shall be indicated.
 - 1 By noting the term "compliance" or "C", it shall be understood that the manufacturer is in full compliance with the item specified and will provide exactly the same with no deviations.
 - 2 By noting the term "deviation" or "D", it shall be understood that the manufacturer prefers to provide a different component in lieu of that specified. Manufacturer shall indicate all deviations.

- 3 By noting the term "alternate" or "A", it shall be understood that the manufacturer proposes to provide the same operating function but prefers to do it in a different manner. An alternate shall be fully described as to what the manufacturer proposes to provide.
- 4 By noting the term "not applicable" or "N/A", it shall be understood that the specified item is not applicable to the project.
- D. It shall be understood that space allocations have been made on the basis of present and known future requirements and the dimensions of items of equipment or devices of a particular manufacturer whether indicated or not. If any item of equipment or device is offered in substitution which differs substantially in dimension or configuration from that indicated on the Drawings or specifications, provide as part of the submittal 1/4 inch equals 1 foot scaled drawings showing that the substitute can be installed in the space available without interfering with other portions of the work or with access for operations and maintenance in the completed project.
- E. Where substitute equipment or devices requiring different arrangement or connections from that indicated is accepted by the Owner's Representative, install the equipment or devices to operate properly and in harmony with the intent of the Contract Documents, making all incidental changes in piping, ductwork or wiring resulting from the equipment or device selection without any additional cost to the Owner. The Contractor shall pay all additional costs incurred by other portions of the work in connection with the substituted equipment or device.
- F. The Owner's Representative reserves the right to call for samples of any item of material, equipment or device offered in substitution, together with a sample of the specific item when, in their opinion, the quality of the item and/or the appearance is involved, and it is deemed that an evaluation of the item may be better made by visual inspection.
- G. When any request for a substitution of material, equipment or device is submitted and rejected, the item named in the Contract Documents shall be furnished. Repetitive submittal of substitutions for the same item will not be considered.

1.13 INSTALLATION DRAWINGS

- A. Prepare installation drawings for coordinating the work of this Section with the work of other Sections, to illustrate its concealment in finished spaces, to avoid obstructions, and to demonstrate the adaptability of any item of material, equipment or device in the space upon which the Contract Documents are based.
- B. Use these drawings in the field for the actual installation of this work. Provide three (3) copies, not for approval, to the Owner's Representative for his information, review and record.

1.14 WORKMANSHIP AND INSTALLATION

- A. In no case shall the Contractor provide a class of material, equipment, device or workmanship less than that required by the Contract Documents or applicable codes, regulations, ordinances or standards. All modifications which may be required by a local authority having legal jurisdiction over all or any part of the work shall be made by the Contractor without any additional charge. In all cases where such authority requires deviations from the requirements of the Drawings or Specifications, the Contractor shall report same to the Owner's Representative and shall secure his approval before the work is started.
- B. The work shall be performed by properly licensed technicians skilled in their respective trades. All materials, equipment and devices shall be installed in accordance with the recommendations of the manufacturer and in the best standard practice to bring about results of a first class condition.
- C. The NECA "Standards of Installation" as published by the National Electrical Contractors Association shall be considered a part of these Specifications, except as specifically modified by other provisions contained in these Specifications.

1.15 INSPECTION OF SITE

- A. The accompanying drawings do not indicate existing installations other than to identify modifications of and extensions thereto. The Contractor shall visit the site, inspect the installations and ascertain the conditions to be met and the work to be performed. Failure to comply with this shall not constitute ground for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work under this Section.
- B. Review construction details of the adjacent building presently under construction during the site inspection and include all work

required to modify the existing installations and install new materials, comprising a part of the installation. Review all construction details of the new building as illustrated on the drawings and be guided thereby.

1.16 WARRANTY

- A. All materials, equipment, devices and workmanship shall be warranted for a period of one year from the date of acceptance by the Owner's Representative for beneficial use by the Owner, except that where specific equipment is noted to have extended warranties. The warranty shall be in accordance with AIA Document A201. The Contractor shall be responsible for the proper registration of these warranties so that the Owner can make all proper claims should future need develop.
- B. The Contractor shall furnish to the Owner's Representative for transmittal to the Owner, the name, address and telephone number of those persons responsible for service on systems and equipment covered by the warranty.

1.17 OPERATION PRIOR TO ACCEPTANCE

When any equipment is operable, and it is to the advantage of the Contractor to operate the equipment, the Contractor may do so provided that he properly supervises the operation, and retains full responsibility for the equipment operated. Regardless of whether or not the equipment has or has not been operated, the Contractor shall clean the equipment properly, make required adjustments and complete punch list items before final acceptance by the Owner.

1.18 INSTRUCTION OF OWNER'S PERSONNEL

- A. Provide the services of competent engineers and/or technicians acceptable to the Owner's Representative to instruct other representatives of the Owner in the complete and detailed operation of each item of equipment or device of all the various electrical systems. These instructions shall be provided for whatever periods may be necessary to accomplish the desired results. Upon completion of these instructions, the Contractor shall obtain a letter of release, acknowledged by the Owner or his authorized representative, stating the dates on which the various kinds of instruction were given, and the personnel to whom the instructions were given.
- B. The Contractor shall be fully responsible for proper maintenance of equipment and systems until the instructions have been given to the Owner's personnel and the letter of release acknowledged.
- C. In providing the instructions to the Owner's personnel, the written operating and maintenance manuals shall be followed in all instances, and the Owner's personnel shall be familiarized with such manuals. Operating and maintenance manuals used for instructions shall include wiring diagrams, manufacturer's operating and maintenance instructions, parts lists (with sources identified), and other data as appropriate for each system.

1.19 SCHEDULE AND SEQUENCE OF WORK

A. The Contractor shall meet and cooperate with the Owner and Owner's Representative to schedule and sequence this work so as to insure meeting scheduled completion dates and avoid delaying other portions of the work. Work requiring special sequencing shall be at no additional cost to the Owner and shall have no impact on the schedule.

1.20 INSTALLATION INSPECTIONS AND CERTIFICATIONS

- A. Obtain timely inspections of the installation by the regulatory authorities. Remedy any deficiencies to the satisfaction of the inspecting official.
- B. Upon final completion of the work, obtain certificates of acceptance from the regulatory authorities. Deliver the certificates to the Owner's Representative for transmission to the Owner.

1.21 EQUIPMENT INSTALLATION

- A. Install equipment and devices in a manner to permit access to all surfaces or components, requiring such access, without the need to disassemble other unrelated parts of the work.
- B. Equipment specified to be factory assembled and tested prior to shipment shall not be disassembled at the job site and reassembled at its final location. Apparatus not so specified may be disassembled and reassembled in the proper location.
- C. Furnish all scaffolding, rigging and hoisting required for the installation of all the work.

1.22 CONCRETE HOUSEKEEPING PADS

- A. Concrete housekeeping pads shall be provided for all floor mounted equipment, unless noted or required otherwise.
- B. All pads shall be not less than 3-1/2" high and extend a maximum 3" beyond the actual equipment size. Coordinate the proper size of the pad with the equipment furnished. Pads shall be poured in forms built of new dressed lumber with corners chamfered using sheet metal or triangular wood strips nailed to the form. Use 6 x 6 No. 3 mesh for reinforcing. Install heavy duty adjustable anchor bolts, set in the form and positioned using templates, prior to pouring concrete. After the equipment is set on the pad, the equipment shall be aligned, leveled and fully grouted to the pad and all void spaces shall be filled with a non-shrinking grout.
- C. Perform all concrete work specified to be provided under this Section in strict accordance with the applicable provisions of Section, CONCRETE.

1.23 SLEEVES

- A. Each conduit, regardless of material, which passes through a concrete slab, masonry wall, or roof or portion of the building structure shall be free from the structure and shall pass through a sleeve.
- B. All sleeves shall be constructed from electrical-metallic tubing or equivalent weight galvanized steel tubing and shall be flush on both sides of the surface penetrated, unless noted otherwise. All sleeves penetrating the roof areas shall extend a minimum 10 inches above the roof with approved weatherproof counterflashing attached to the conduit above the roof. All sleeves penetrating floors shall extend a minimum of 6 inches above the finished floors. The sleeves shall be sized to allow free passage of the conduit to be inserted.
- C. Sleeves passing through walls or floors on or below grade or in moist areas shall be constructed of galvanized rigid steel and shall be designed with a suitable flange in the center to form a waterproof passage. After the conduit has been installed in the sleeves, the void space around the conduit shall be caulked and filled with an asphalt-base compound to insure a waterproof penetration. Jute twine caulking shall not be used due to susceptibility to termite infestation.

1.24 ESCUTCHEONS

- A. In each finished space, provided a chromium plated, sectional escutcheon on each conduit, or hanger rod penetrating a wall, floor or ceiling.
- B. Size escutcheons and collars to fit snugly around conduit and rods.
- C. Where required, provide escutcheons with set screws so that they fit snugly against the finished surface.

1.25 ACCESS PANELS

- A. Provide wall and ceiling access panels for unrestricted access to all concealed electrical equipment items and devices installed behind furrings, chases or non-removable suspended ceilings.
- B. Access panels shall be UL listed and labeled as required to suit the fire rating of the surface in which installed, with mounting straps, concealed hinges, screwdriver locks, 180 degree open door design, 16 gauge steel construction and door and frame finished in prime coat finish. Panels shall be 12-inch by 12-inch minimum size, but shall be larger as the access requirement of the concealed electrical equipment item or device increases.

1.26 SEALING OF PENETRATIONS

- A. All penetrations in horizontal or vertical fire-rated construction shall be sealed using approved fire-rated sealing materials equivalent to the following:
 - 1 Foam: Dow Corning 3-6548 RTV silicone foam, liquid component Part 4 (black) and liquid component Part B (off-white).
 - 2 Sealant: Dow Corning 96-081 RTV silicone adhesive sealant.
 - 3 Damming Materials: Mineral fiberboard, mineral fiber matting, mineral fiber putty, plywood or particle board, as selected by applicator.
- B. Preparation: Remove combustible materials and loose impediments from penetration opening and involved surfaces. Remove

free liquid and oil from penetration surfaces.

- C. Installation: In accordance with manufacturer's instructions, install damming materials and sealant to cover and seal penetration openings; inject foam mixtures into openings.
- D. In addition to the Dow Corning products, equal products by Spec Seal Firestop Products, 3M Fire Barrier or CS240 Firestop are acceptable.

1.27 PROTECTION OF APPARATUS

- A. At all times take every precaution to properly protect apparatus from damage due to dust, dirt, water, etc. or from damage due to physical forces. Include the erection of temporary shelters as required, to adequately protect any apparatus stored at the site, the cribbing of any apparatus directly above the construction, and the covering of apparatus in the incomplete building with tarpaulins or other protective covering. Failure on the part of the Contractor to comply with the above to the entire satisfaction of the Owner's Representative will be sufficient cause for the rejection of the pieces of apparatus in question.
- B. Responsibility for the protection of apparatus extend also to existing apparatus involved in this Section of the work, whether such apparatus is designated to be used temporarily and later removed, or is to be reused as a part of the permanent installation. Erect temporary sheltering structures, provide temporary bracing and supports, or cover equipment as required or directed to afford proper protection for that equipment.
- C. The Contractor shall protect this work and the work of all other Contractors from damage by his work or workmen and shall make good any damage thus caused. He shall also be responsible for the proper protection of his equipment, machinery, materials and accessories delivered and installed on the job.

1.28 INSTALLATION OF CONTROL AND OPERATING DEVICES

- A. The highest operable part of controls (light switches, dimmer switches, emergency power off devices, etc.), receptacles (electrical and communications) and other operable devices shall be 48" above finish floor. The lowest operable part shall be no less than 15" above finished floor. For purposes of uniformity, unless noted otherwise, the top of a device shall be maximum 48" AFF and the bottom of a device shall be minimum 15" AFF. Refer to the electrical symbols list on the Drawings for specific requirements.
- B. Visual alarm appliances shall be placed 80" above finished floor (the highest floor level within a space) or 6" below the ceiling, whichever is lower.

1.29 INSTALLATION AND CONNECTION OF OTHER SECTION'S EQUIPMENT

A. Verify the electrical requirements of all equipment furnished under other Sections, separate contracts, or by the Owner. Install conduit, power wiring, control wiring, devices, etc. as required for complete operation of all equipment.

1.30 OPTION TO RELOCATE OUTLETS AND RELATED DEVICES

A. The location of power, data and telephone outlets, wall switches and other related devices

may be relocated at the Owner's option, at no

additional cost to the Owner, to a point within10 feet of their present location provided the Contractor is notified prior to installation.

1.31 COOPERATION AND CLEAN-UP

- A. It shall be the responsibility of the Contractor to cooperate fully to keep the job site in a clean and safe condition. Upon the Contractor shall immediately remove all of his tools, equipment, surplus materials and debris.
- B. After he installation is complete and before the equipment is energized, clean the interior and exterior of all equipment thouroughly. Clean equipment, removing all debris, rubbish and foreign materials. Each component shall be cleaned and all dust and other foreign material. Components shall be cleaned of oxidation. The inside and outside of all switchgear shall also be wiped clean with lemon-oil rag after all other cleaning is complete. Any portion of the work requiring touch-up finishing shall be so finished to equal the specified finish on the product.

1.32 RECORD DRAWINGS AND DOCUMENTATION FOR OWNER

- A. The Contractor shall obtain at his own expense a complete set of blueline prints on which to keep an accurate record of the installation of all materials, equipment and devices covered by the Contract. The Contractor shall record up to date information at least once a week and retain the set of prints on site for periodic review by the Architect/Engineer. The record drawings shall indicate the location of all equipment and devices, and the routing of all systems. If the Contractor prepared large scale installation drawings of electrical rooms, conduit routing, busduct, routing, etc., these drawings or reproducible sepias therefrom shall be revised as required to accurately illustrate the actual installation. All conduit buried in concrete slabs, walls and below grade shall be located by dimension; both horizontally and by vertical elevation, unless a surface mounted device in each space indicates the exact location.
- B. Upon anticipated completion of the job, obtain one complete reproducible set of the original drawings on which to neatly, legibly and accurately transfer all project related notations and deliver these record drawings to the Architect/Engineer at job completion before final payment and delivery to the Owner. This information shall be delivered prior to final acceptance.
- C. The Contractor shall accumulate in duplicate during the job progress, the following data prepared in indexed 3-ring looseleaf, hard-back binders sized for 8-1/2 inch by 11 inch sheets. No binder shall exceed 3-1/2 inches thick. This data shall be turned over to the Owner's Representative for review and subsequent delivery to the Owner prior to final acceptance.
 - 1 Warranties, guarantees and manufacturer's directions on material, equipment and devices covered by the Contract.
 - 2 Approved lighting fixture brochures, wiring diagrams and control diagrams.
 - 3 Copies of approved submittals and shop drawings.
 - 4 Operating instructions and recommended maintenance procedures for major apparatus.
 - 5 Copies of all other data and/or drawings required during construction.
 - 6 Repair parts list of major apparatus, including name, address and telephone number of local supplier or representative.
 - 7 Tag charts and diagrams hereinbefore specified.

1.33 FINAL OBSERVATION

- A. The purpose of the final observation is to determine whether the Contractor has completed the construction in accordance with the Contract Documents and that in the Owner Representative's opinion the installation is satisfactory for final acceptance by the Owner.
- B. It shall be the responsibility of the Contractor to assure that the installation is ready for final acceptance prior to calling upon the Owner's Representative to make a final observation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLE

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. All wire shall be soft drawn annealed copper(with conductivity of not less than 98% that of pure copper) with THHN/THWN 600-volt color coded insulation.
- E. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 8.
- F. Conductor Material: Copper.
- G. Stranding: Solid conductor for No. 10 AWG and smaller; stranded conductor for larger than No. 10 AWG.
- H. 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: TypeXHHW-2 or THWN, in raceway.
- B. Feeders: Type 75C insulation THWN-2, in raceway; stranded for #8 and larger; solid for #10 and smaller.
- C. Fire-Pump Feeder: Type MI, 3-conductor.
- D. Branch Circuits: Type THWN-2 in raceway, stranded for #10 and larger; solid for #8 and smaller; minimum #12 size.
- E. Fire Alarm Circuits: Type THWN-2, in raceway.
- F. Class 1 Control Circuits: Type THWN-2, in raceway.
- G. Class 2 Control Circuits: Type THWN-2, 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.

SECTION 26 05 26 - GROUNDING AND BONDING

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. List below only products, construction, and equipment that the reader might expect to find in this Section but are specified elsewhere.
 - 2. Section "Underground Ducts and Utility Structures" for ground test wells.

1.3 SUBMITTALS

- A. Revise this Article to suit Project and office practice. Frequently, no product submittal is required for this Section.
- B. Product Data: For each type of product indicated.
- C. Retain paragraph above if Product Data are required for each product specified. Retain paragraph below if Product Data are required only for selected products.
- D. Product Data: For the following:
 - 1. Ground rods.
 - 2. Chemical rods.
 - 3. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- E. 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. Retain paragraph and subparagraph below if Contractor or manufacturer selects testing agency. Delete if Contractor is allowed to perform ground-resistance testing.
- B. 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.
- C. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.
- D. 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. Retain above for nonproprietary or below for semiproprietary Specification. Refer to Division 1 Section "Materials and Equipment."
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. See Editing Instruction No. 1 in the Evaluations for cautions about naming products and manufacturers.
 - 2. 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.
 - 1. 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. If only copper conductors are permitted in Division 16 Section "Conductors and Cables," delete paragraph below.
- C. Material: copper.
- D. Equipment Grounding Conductors: Insulated with green-colored insulation.
- E. 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.
- F. Grounding Electrode Conductors: Stranded cable.
- G. Underground Conductors: stranded, unless otherwise indicated.
- H. Sizes and types below are typical. Adjust to suit Project conditions and requirements.
- I. 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.
- J. Delete paragraph and subparagraphs below if use of aluminum conductors is not permitted.
- K. 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.
- L. 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. Copper-clad steel is most common. See Evaluations for discussion on where other materials might be more appropriate.
- B. Ground Rods: Copper-clad steel.
 - 1. Select paragraph above or paragraph and subparagraph below. Sectional types are used when rods longer than 10 feet (3 m) are installed.
 - 2. Size: 3/4 by 120 inches (19 by 3000 mm) in diameter.
- C. 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.
- D. Test Wells: Provide handholes as specified in Section "Underground Ducts and Utility Structures."

PART 3 - EXECUTION

3.1 APPLICATION

- A. Delete paragraph below if only copper conductors are specified in Division 16 Section "Conductors and Cables."
- B. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- C. In raceways, use insulated equipment grounding conductors.
- D. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.
- E. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
- F. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.
- G. Delete paragraph and subparagraphs below if grounding bus is not required, or edit to suit Project.
- H. 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.
- I. Edit below to suit Project.
- J. 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. NEC permits two basic types of equipment grounding conductors: metallic raceway or cable sheath as the conductor, or a separate equipment grounding conductor. The installation of an equipment grounding conductor provides an additional degree of safe operation when compared to relying on raceway as the conductor. Revise paragraphs and subparagraphs in this Article to suit Project.
- B. 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.
- C. Install equipment grounding conductors in all feeders and circuits.
- D. Select paragraph above or paragraph and subparagraphs below.
- E. 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.
- F. 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.
- G. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.
- H. 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.
- I. 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.
- J. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
- K. 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.
- L. 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.
- M. Coordinate paragraph and subparagraphs below with Drawings and Specification Sections for systems referenced. Edit to suit Project.
- N. 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.
- O. 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. Coordinate paragraph and subparagraphs below with Drawings.
- B. 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.
- C. 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.
- D. 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.
- E. 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.
- F. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.
- G. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torquetightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- H. 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.
- I. 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. Retain one of three paragraphs below.
- B. 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. NFPA 70 has minimum value of 25 ohms. See Evaluations for discussion on appropriate grounding resistance values. Values listed below are typical; adjust to suit Project conditions.
 - b. Equipment Rated 500 kVA and Less: 10 ohms.
 - c. Equipment Rated 500 to 1000 kVA: 5 ohms.
 - d. Equipment Rated More Than 1000 kVA: 3 ohms.
 - e. Substations and Pad-Mounted Switching Equipment: 5 ohms.
 - f. 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. Delete below if inappropriate or if surface restoration work is covered on Drawings or in Division 2 Sections. Coordinate with Drawings.
- B. 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.

SECTION 26 05 29 - HANGERS AND SUPPORTS

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. Suspension hangers for individual conduit runs shall be zinc plated formed steel type.

- B. Vertical Supports
 - 1. Malleable iron one hole pipe straps shall be used for vertical runs
- C. Clamps
 - 1. Beam clamps shall be used for bar joists and beams.
- D. Anti-Vibration Hangers
 - 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 26 51 00
- B. 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:
- B. NOMINAL CONDUIT SIZE ROD DIAMETER

1/2" through 2 1/4"

2-1/2" through 3 3/8"

4" and 5 1/2"

- 1. 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".
- 2. Where numerous conduits are run parallel to one another, they may be supported from a trapeze type hanger arrangement with strut bottom.
- 3. Anti-vibration type hangers shall be provided for equipment as required to minimize vibration and/or as directed by the Architect/Engineer.

Supports

- 4. Support of hangers shall be by means of sufficient quantities of individual after set steel expansion shields, or beam clamps attached to structural steel.
- 5. Stiff-legs shall be furnished and installed in cases where support from overhead structure is not possible.
- 6. 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.
- 7. Furnish and install complete any additional structural support steel, brackets, fasteners, etc., as required to adequately support all raceway and equipment.
- 8. Support of hangers from concrete slabs shall be by means of sufficient quantity of "U" brackets attached with after set expansion shields and bolts.
- 9. 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.

SECTION 26 05 33 - RACEWAYS AND BOXES

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. Edit lists below to suit Project.
 - 2. 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.
 - 3. 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. List below only products and equipment for this Project that the reader might expect to find in this Section but are specified elsewhere. Verify that Section titles listed below are correct for this Project's Specifications because Section titles may have changed since this Section was updated.
- 2. Section "Basic Electrical Materials and Methods" for raceways and box supports.
- 3. 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. Delete below except for custom enclosures.
 - C. 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. Retain above for nonproprietary or below for semiproprietary Specification. Refer to Division 1 Section "Materials and Equipment."
- C. 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. Aluminum conduits NOT ACCEPTABLE.
 - b. American Electric; Construction Materials Group.
 - c. Crouse-Hinds; Div. of Cooper Industries.
 - d. Emerson Electric Co.; Appleton Electric Co.
 - e. Hubbell, Inc.; Killark Electric Manufacturing Co.
 - f. Lamson & Sessions; Carlon Electrical Products.
 - g. O-Z/Gedney; Unit of General Signal.
 - h. Scott Fetzer Co.; Adalet-PLM.
 - i. 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: steel compression 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. Select 1 of 4 paragraphs below.
- E. Wireway Covers: Screw cover type flanged-and-gasketed type.
- F. Finish: Manufacturer's standard enamel finish.

2.5 OUTLET AND DEVICE BOXES

- A. Sheet Metal Boxes: NEMA OS 1.
- B. Edit paragraph below. Aluminum is also available and suitable for use with steel raceways.
- C. 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. Use a comprehensive wiring method schedule on Drawings or use this Article to specify where various raceway types are to be installed. Edit examples below, adding or deleting materials and methods to suit Project. Coordinate with Division 16 Section "Wires and Cables." Do not duplicate information on Drawings, in NFPA 70, or in other Division 16 Sections. List exceptions to stated requirements. Check code to avoid specifying uses not permitted.
- B. Minimum sizes required: Unless larger conduit sizes are required by NEC, are shown on drawings or are required by the Work itself, provide the following minimum size conduits.:

- a. Above grade: $\frac{3}{4}$ "
- b. Below grade: 2"
- C. Outdoors: Use the following wiring methods:
 - 1. Exposed: Rigid threaded hot-dipped galvanized steel. Do not use thread-less fittings.
 - 2. Concealed: Rigid steel.
 - 3. Underground, Single Run: Sch 40(heavy wall) PVC. All elbows for service entrance conduits are to be long-radius type.
 - 4. Underground, Grouped: Sch 40(heavy wall) PVC. All elbows for service entrance conduits are to be long-radius type..
 - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC rated for outdoors.
 - 6. Boxes and Enclosures: NEMA 250, Type 3R.
- D. Indoors: Use the following wiring methods:
 - 1. Exposed: Hot dip galvanized EMT with steel compression fittings.
 - 2. Concealed: Hot dip galvanized EMT with steel compression fittings.
 - 3. Underground, Single Run: Sch 40(heavy wall) PVC. All elbows for service entrance conduits are to be longradius type..
 - 4. Underground, Grouped: Sch 40(heavy wall) PVC. All elbows for service entrance conduits are to be long-radius type..
 - 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. Select 1 of 2 subparagraphs below and add other specific box and enclosure requirements to suit Project.
 - b. 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. Select paragraph above or below.
- C. Minimum Raceway Size: 3/4-inch trade size (DN21).
- D. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.
- E. 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.

- F. Install raceways level and square and at proper elevations. Provide adequate headroom.
- G. Complete raceway installation before starting conductor installation.
- H. Support raceways as specified in Section "Basic Electrical Materials and Methods."
- I. Use temporary closures to prevent foreign matter from entering raceways.
- J. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- K. 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.
- L. 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.
- M. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.
- N. 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.
- O. 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.
- P. 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.
- 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. Delete paragraph below if not applicable.
- V. 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.
 - W. 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.
 - X. 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.
 - Y. Delete paragraph below if no high-frequency installation.
 - Z. 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.
 - AA. Do not install aluminum conduits embedded in or in contact with concrete.
 - BB.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.
 - CC.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.
 - DD. Set floor boxes level and adjust to finished floor surface.

EE. Select paragraph above for metal floor boxes and below for nonmetallic floor boxes.

- FF. Set floor boxes level and trim after installation to fit flush to finished floor surface.
- GG. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
- **HH.** 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.

SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

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.

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 electrical identification, including related accessories.
- B. Provide electrical identification for the following:
 - 1. 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.
 - 2. Raceways, junction boxes and pull boxes.
 - 3. 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.
 - 4. Wiring devices.
 - 5. Wiring.
 - 6. Three phase motor rotation.

1.3 SUBMITTALS

A. Submit product data in accordance with Section for products specified under PART 2 - PRODUCTS.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Brady
- B. Panduit
- C. Thomas & Betts
- D. Seton

2.2 IDENTIFICATION

- A. Nameplates
 - 1. Nameplates shall be black engraved surface on white core for normal power circuits and red engraved surface on white core for emergency power circuits.
 - 2. 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:



3. 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'

- 4. 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.
- 5. Nameplates shall be laminated, white core, plastic with beveled edges, minimum 1/16 inch thick. Lettering shall be machineengraved, not less than 1/4" high, cut through the black or red surface to the white core.
- B. Junction Boxes and Pull Boxes
 - 1. 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.
- C. Wiring Device Wall Plates
 - 1. 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.
- D. Wire Markers
 - 1. Wire markers for identification of wiring shall be self-adhesive type having letters and numerals indicating serving equipment and feeder or branch circuit number.
- E. Rotation Tags
 - 1. Rotation tags shall be brass or aluminum securely attached to equipment.

PART 3 EXECUTION

3.1 PREPARATION

A. Surfaces to receive labels or nameplates shall be carefully prepared in accordance with the manufacturer's instructions and recommendations.

3.2 NAMEPLATES

ELECTRICAL IDENTIFICATION

A. Nameplates shall be properly attached to identify panelboards, feeder circuit breakers, disconnect switches, pull boxes and other similar equipment furnished under this section.

3.3 WIRE MARKERS

A. 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.

SECTION 26 21 17 - SITE ELECTRICAL

PART1 -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. Contractor is responsible to call 811 prior to any work. 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.

SECTION 26 24 16 - PANELBOARDS

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. Edit panelboards below to suit Project.
 - 2. Lighting and appliance branch-circuit panelboards.
 - 3. Distribution panelboards.
- B. Related Sections include the following:
 - 1. List below only products, construction, and equipment that the reader might expect to find in this Section but are specified elsewhere.
 - 2. Retain subparagraph below if Project includes fusible panelboards.
 - 3. Section "Fuses."

1.3 DEFINITIONS

- A. Retain abbreviations that remain after this Section has been edited.
- B. EMI: Electromagnetic interference.
- C. GFCI: Ground-fault circuit interrupter.
- D. RFI: Radio-frequency interference.
- E. RMS: Root mean square.
- F. SPDT: Single pole, double throw.
- G. 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. Delete subparagraph below if series rating of overcurrent protective devices is not used.
- e. UL listing for series rating of installed devices.
- f. 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 fieldinstalled wiring.
- C. Delete paragraph below if independent testing agency is not used.
- D. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.
- E. 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.
- F. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
- G. 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. Retain paragraph and subparagraph below if Contractor or manufacturer selects testing agency.
- B. 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.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.

1.6 COORDINATION

- A. Edit below to delete or add types of equipment that affect panelboard installation.
- B. 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. Extra materials may not be allowed for publicly funded projects. Revise quantity below to suit Project.
- B. 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. Retain above for nonproprietary or below for semiproprietary Specification. Refer to Division 1 Section "Materials and Equipment."
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Lists below are examples only. Retain or insert only those manufacturers whose products correspond with other requirements and whose availability and suitability for the application have been verified.
 - 2. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
 - a. Eaton
 - b. Square D Co.
 - c. General Electric
 - d. Siemens

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. Delete items below if not applicable. Add other Project-specific requirements.
 - 2. Outdoor Locations: NEMA 250, Type 3R.
 - 3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - 4. Enclosures in hazardous locations must be carefully selected to meet the division and group listing of the environment.
 - 5. 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. Retain paragraph above or below.
- D. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
- E. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
- F. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.
- G. Bus: Hard-drawn copper, 98 percent conductivity.
- H. Main and Neutral Lugs: Copper mechanical type suitable for use with conductor material.
- I. Ten paragraphs below are special features. Add other required features and coordinate with Drawings.
- J. Equipment Ground Bus: Copper and adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
- K. Delete paragraph below except for panelboards incorporating one or more main service disconnect switches. Edit to suit Project.

- L. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.
- M. Delete paragraph below if future provisions are not required.
- N. Isolated Equipment Ground Bus: Copper and adequate for branch-circuit equipment ground conductors; insulated from box.
- O. Extra-Capacity Neutral Bus: Copper neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
- P. Split Bus: Vertical buses divided into individual vertical sections.
- Q. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
- R. Gutter Barrier: Arrange to isolate individual panel sections.
- S. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.
- T. 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. Select one of two paragraphs below for series-rated system or system that has panelboards and circuit breakers rated for full value of short-circuit current available at location of equipment. Edit to suit Project and coordinate with Drawings.
- B. 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. Coordinate below with Drawings.
- C. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 DISTRIBUTION PANELBOARDS

- A. Edit three paragraphs and associated subparagraphs below to suit Project. Coordinate with Drawings.
- B. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike.
- C. Main Overcurrent Protective Devices: Circuit breaker.
- D. 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. Edit three paragraphs and associated subparagraphs below to suit Project. Coordinate with schedules and Drawings.
- B. 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 I²t 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.
- C. 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.
- D. 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. Revise paragraph below if "Balancing Loads" Paragraph is deleted from "Field Quality Control" Article below.
- E. 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.
- F. Install filler plates in unused spaces.
- G. Revise below if "Balancing Loads" Paragraph is deleted from "Field Quality Control" Article below.
- H. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

3.2 IDENTIFICATION

- A. Select Division 16 Section "Basic Electrical Materials and Methods" for projects with simple requirements and Division 16 Section "Electrical Identification" for projects with complex requirements.
- B. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section "Basic Electrical Materials and Methods] [Electrical Identification."

C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

- A. Coordinate paragraphs below with Drawings.
- B. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.
- 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.

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.
 - 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.

SECTION 26 27 17 - EQUIPMENT WIRING

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

1.3 MATERIALS

EQUIPMENT WIRING

A. Materials and equipment provided hereinafter shall comply with other Electrical Sections and with HVAC/Plumbing Specifications.

PART 3 - EXECUTION

1.4 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.

1.5 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 sections 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 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. 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.

SECTION 26 27 26 - WIRING DEVICES

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. Retain abbreviations that remain after this Section has been edited for Project.
- B. GFI: Ground-fault circuit interrupter.
- C. 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. Include sample review below if products may have critical features needing hands-on appraisal.
- D. Samples: For devices and device plates for color selection and evaluation of technical features.
- E. 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. Delete paragraph below unless receptacles for Owner-Furnished equipment with plugs have unknown configurations.
- B. Receptacles for Owner-Furnished Equipment: Match plug configurations.
- C. 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. Hubbell, Inc.;HBL series Wiring Devices Div.
 - b. Or equal

2.2 RECEPTACLES

- A. Select one of three paragraphs below to specify grade of receptacles. See Editing Instruction No. 3 in the Evaluations for wiring device grades.
- B. Straight-Blade and Locking Receptacles: Heavy-Duty grade. The device shall be 20-ampere, 125-volts, Nema configuration 5-20R, back and side wired.
- C. Special Receptacles for NEMA configuration refer to Manufacturer specs.
- D. Termination-type GFCI unit may be substituted for feed-through type where no protection of downstream receptacles is required.
- E. 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. Equal to Hubbell GF series. Feeding downstream more than one receptacle from a single GFI receptacle is not acceptable.
- F. 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.
 - 2. Devices: Listed and labeled as solated-ground receptacles.
 - 3. Isolation Method: Integral to receptacle construction and not dependent on removable parts.

2.3 SWITCHES

- A. General
 - 1. Switches shall be 20Amp heavy duty specification grade equal to Hubbell HBL series. The body of the switch shall be made of an arc-resistant thermoset material.
 - 2. Switches shall be SPST, DPST, 3-way or 4-way as indicated on the Drawings.
 - 3. Switch color shall be selected by owner. 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. Modify subparagraph below to suit preference.
 - 2. Control: Continuously adjustable slide, toggle, or rotary knob. Single-pole or three-way switch to suit connections.
 - 3. 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.
 - 4. Plate-Securing Screws: Metal with head color to match plate finish.
 - 5. Device plates: High-impact smooth nylon equal to Hubbell P8 series. Color finish shall be selected by owner. Coordinate with Architect.

2.5 FLOOR SERVICE FITTINGS

- A. Items in this Article are available for telephone and data cable service as well as power. Edit to suit Project.
- B. Select one of three paragraphs below.
- C. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.
- D. 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. Coordinate two paragraphs below with Drawings.
- F. 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.
- G. Protect devices and assemblies during painting.
- H. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit arrangement of partitions and furnishings.
- I.

3.2 IDENTIFICATION

- A. Comply with Section "Electrical Identification."
- B. Select paragraph above or below.
- C. 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. Select paragraph above or below. Coordinate with Division 16 Section "Grounding."
- B. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.
- C. Isolated-Ground Receptacles: Connect to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.
- D. 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. Dparagraph below if GFCIs are not in Part 2.
- C. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- D. 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.

SECTION 26 28 13 - FUSES

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. Use this Article to convey basic design intent. Delete if Drawings show sufficient detail to clarify intent.
- B. General: Submit each item in this Article according to the Conditions of the Contract and Specification Sections.
- C. Product Data for each fuse type specified.
- D. Select above or below. Data listed in paragraph below are appropriate where selective coordination is necessary.
- E. Field test reports indicating and interpreting test results.
- F. 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. Subparagraph below is required by some Federal agencies.
 - 3. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.5 EXTRA MATERIALS

- A. Extra materials may not be allowed for publicly funded projects.
- B. 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. Retain above for nonproprietary or below for semiproprietary Specification. Refer to Division 1 Section "Materials and Equipment."
- C. Manufacturers: Subject to compliance with requirements, provide fuses by one of the following:
 - 1. See Editing Instruction No. 1 in the Evaluations for cautions about naming products and manufacturers.
 - 2. Cooper Industries, Inc.; Bussmann Div.
 - 3. Eagle Electric Mfg. Co., Inc.
 - 4. Ferraz Corp.
 - 5. General Electric Co.; Wiring Devices Div.
 - 6. Gould Shawmut.
 - 7. 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 keycoded 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. Select and edit paragraphs below. Add paragraphs as Project requires to specify fuse applications rather than show them on Drawings.
- B. Motor Branch Circuits: Class RK1, time delay.
- C. 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.

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. General Electric
- D. 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

- E. Install disconnect switches where indicated shown or not shown.
- F. Install fuses in fusible disconnect switches.

SECTION 26 51 00 - INTERIOR LIGHTING

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. Select one of two subparagraphs below. With second subparagraph, photometric tests by manufacturer's laboratory are acceptable.
 - 3. Certified results of laboratory tests for fixtures and lamps for photometric performance.
 - 4. Emergency lighting unit battery and charger.
 - 5. LED lights
 - 6. Retain two subparagraphs below for projects with air-handling fixtures.
 - 7. Types of lamps.
- B. Delete paragraph and subparagraph below unless custom fixtures are indicated.
- C. 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.
- D. Consider retaining paragraph below for projects with congested ceiling space and where Drawings do not include comprehensive reflected ceiling plans.
- E. 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.
- F. Retain paragraph and subparagraphs below if fixture Samples are required for verification purposes. Edit if sample requirements are indicated in other than interior lighting fixture schedule. As an alternative, list of fixture types for sample submission can be added below.
- G. Delete paragraph below if not required.
- H. Product Certificates: Signed by manufacturers of lighting fixtures certifying that products comply with requirements.
- I. Delete paragraph below except for projects with extensive tests of emergency lighting equipment.

- J. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- K. 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. Delete paragraph below if FM compliance is not required. Coordinate with Drawings.
- D. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.5 COORDINATION

- A. Retain this Article if Coordination Drawings are not required.
- B. 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. NFPA 70 requires minimum support for fixtures. Retain paragraphs below for more specific support requirements and for requirements exceeding code minimums. Units in seismic zones must have additional supports and restraining devices beyond those specified here. See Editing Instruction No. 3 in the Evaluations.
- C. 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.
- D. 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.

SECTION 26 56 00 - EXTERIOR LIGHTING

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. Delete "independent" in subparagraph below if certified tests by manufacturer are adequate.
 - 3. Select one of two subparagraphs below. With second subparagraph, photometric tests by manufacturer's laboratory are acceptable.
 - 4. Certified results of independent laboratory tests for fixtures and lamps for electrical ratings and photometric data.
 - 5. Certified results of laboratory tests for fixtures and lamps for photometric performance.
 - 6. High-intensity-discharge luminaire ballasts.
- B. Product Certificates: Signed by manufacturers of lighting units certifying that products comply with requirements.
- C. Delete paragraph below except for projects with extensive tests of installations.
- D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- E. 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. Retain above for nonproprietary or below for semiproprietary Specification, and name products in schedules or details.
- C. 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.
- M. 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): ≥ 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): $\leq 20\%$.
 - 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

EXTERIOR LIGHTING

- 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.