CITY OF AUSTIN
WATERSHED PROTECTION DEPARTMENT

PROJECT MANUAL
Contract Documents and Technical Specifications

VOLUME 1 of 2

WALLER CREEK TUNNEL INLET FACILITY
WET WELL MECHANICAL SCREENING SYSTEM

C.I.P. PROJECT NUMBER: 10878.007
SOLICITATION NUMBER: CLMC974

Prepared by

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Austin, Texas, 78729
TBPE REG. No. F-3580

CITY OF AUSTIN
Watershed Protection Department
411Chicon Street
Austin, TX 78702

March 2023

The City of Austin is committed to compliance with the Americans with Disabilities Act. Reasonable modifications and equal access to communications will be provided upon request.

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CITY OF AUSTIN
Watershed Protection Department

PROJECT MANUAL

FOR

WALLER CREEK TUNNEL INLET FACILITY
WET WELL MECHANICAL SCREENING SYSTEM

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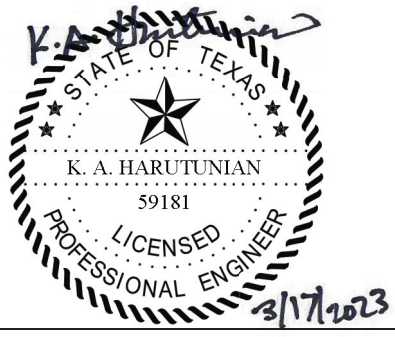

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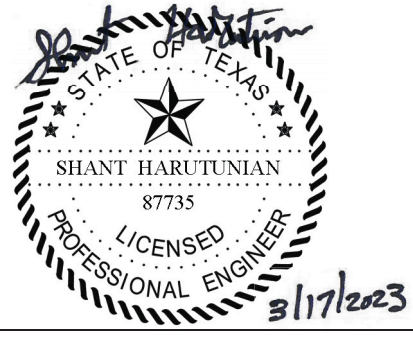

Certifications

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ADDENDUM NO. 1

Date: May 8, 2023

City of Austin

Project Name: Waller Creek Tunnel Inlet Facility Wet Well Mechanical Screening System

C.I.P. No.: 10878.007 IFB No.: 6100

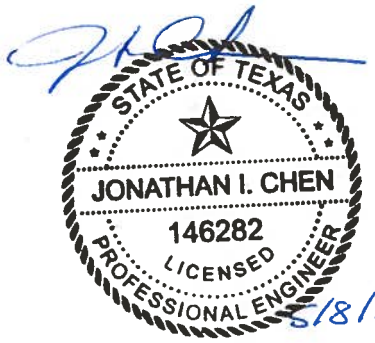
This Addendum forms a part of the Contract and corrects or modifies original Bid Documents, issued on April 24, 2023. **Acknowledge receipt of this addendum in space provided on bid form.** Failure to do so may subject bidder to disqualification.

A. Project Manual Revisions:

1. Delete Section 11327 (Mechanical Screening Systems) Page 2 of 13 and insert attached Section 11327 (Mechanical Screening Systems) Page 2 of 13.
2. Delete Section 11327 (Mechanical Screening Systems) Page 4 of 13 and insert attached Section 11327 (Mechanical Screening Systems) Page 4 of 13.

Susan Kenzle
Approved by OWNER

Jonathan I. Chen
Approved by ENGINEER/ARCHITECT



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ADDENDUM NO. 2

Date: May 10, 2023

City of Austin

Project Name: Waller Creek Tunnel Inlet Facility Wet Well Mechanical Screening System

C.I.P. No.: 10878.007 IFB No.: 6100

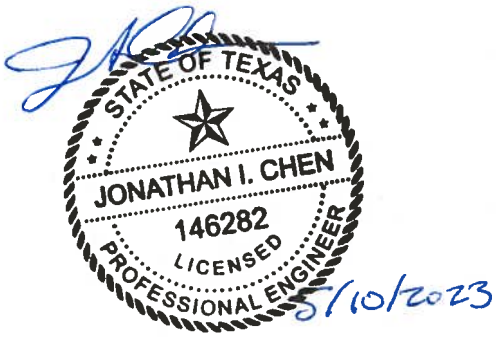
This Addendum forms a part of the Contract and corrects or modifies original Bid Documents, issued on April 24, 2023. **Acknowledge receipt of this addendum in space provided on bid form.** Failure to do so may subject bidder to disqualification.

A. Project Manual Revisions:

1. Delete Section 11327 (Mechanical Screening Systems) Page 7 of 13 and insert attached Section 11327 (Mechanical Screening Systems) Page 7 of 13.
2. Delete Section 11327 (Mechanical Screening Systems) Page 8 of 13 and insert attached Section 11327 (Mechanical Screening Systems) Page 8 of 13.

Susan Kenzle
Approved by OWNER

Jonathan I. Chen
Approved by ENGINEER/ARCHITECT



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NOT USED

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NOT USED

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NOT USED

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NOT USED

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END

1. OVERVIEW AND PROJECT INFORMATION

Following is a summary of information for this Project. Bidder is cautioned to refer to other sections of the Project Manual, Drawings and Addenda (Bid Documents) for further details.

The City of Austin, hereafter called OWNER, is requesting Bids for furnishing all labor, materials, equipment, supervision, and incidentals, and for performing all Work required for the following:

Project:	Waller Creek Tunnel Inlet Facility Wet Well Mechanical Screening System
Located at:	500 E. 12th Street, Austin, Texas
CIP ID No.:	10878.007
Solicitation No.:	CLMC974

The Work consists of the following:

1. Installation of two (2) multi-rake mechanical screen cleaning mechanisms. Installation of multi-rake screen cleaning equipment includes but is not limited to all rakes, bar screens, discharge chutes, debris hoppers, water level sensors, debris monitoring level sensors, motors, sprockets, and structural support structure.
2. Installation of two (2) submersible irrigation pumps. Installation of irrigation pumps includes but is not limited to all associated piping and appurtenances to connect from the proposed pumps to the proposed irrigation skid and all associated piping and appurtenances to connect from the proposed irrigation skid to the irrigation system connection point and hydrants on the operating deck.
3. Demolition of existing irrigation skid and installation of one (1) packaged irrigation skid to incorporate proposed irrigation pumps includes but is not limited to piping and valving, variable frequency drives, pressure switch, and PLC. Provide control capability that allows for pump control, monitoring, and communications to the existing SCADA system.
4. Installation of an air quality monitoring system for the lower wet well channel area as shown on PLANS.
5. Providing equipment access by modifying existing handrails, guardrails and grated walkways on the operations deck and in the upper and lower wet well channel areas.
6. Installation of all power and control cables.
7. Removal of all construction debris and site clean up.
8. All remaining and associated items of work contained in the Contract Documents as shown on PLANS.

2. BID DOCUMENTS

Bid Documents are obtained through the City's Vendor Connection website, log on https://financeonline.austintexas.gov/afo/account_services/solicitation/solicitations.cfm. A complete set of Bid Documents, including all sections of the Project Manual and Drawings, are included in the attachments section of each solicitation.

All addenda and answers to Bidders' questions will also be posted in the attachments section for each solicitation on the City's Vendor Connection website.

3. SUBMISSION OF BIDS

Sealed Bids may be submitted to the Capital Contracting Bid Opening Desk located at One Texas Center, 505 Barton Springs Rd., Suite 330, Austin, Texas 78704, or may be submitted electronically (see eResponse Instructions).

Sealed Bid may be mailed using address below:

Address for US Mail	
City of Austin	
Capital Contracting	
505 Barton Springs Road, Suite 330	
Austin, Texas 78704	

NOTE: Bids must either be received and time stamped at Capital Contracting prior to the Due Date and Time or submitted electronically via Austin Finance Online. The time of record for those electronically submitted is the time received in Austin Finance OnLine. It is the responsibility of the Offeror to ensure that their Bid arrives at the reception desk at Capital Contracting or electronically prior to the time and date indicated. Arrival at the City's mailroom, mail terminal, or post office box will not constitute the Bid arriving on time.

Public Bid Opening Update
Capital Contracting will NOT conduct an in-person bid opening. Bidders must either submit their bids and compliance plans no earlier than 10:00 AM and prior to 2:00 PM on the date bids are due to One Texas Center, 505 Barton Springs Rd., Suite 330, Austin, Texas 78704; or must submit Bids and Compliance Plans electronically via Austin Finance Online prior to 2:00 PM on the day bids are due. Bids and compliance plans submitted after 2:00 PM on the date bids are due will not be accepted. Capital Contracting will open both the sealed bids and bids received electronically via Austin Finance Online at 3:00 PM on the date bids are due.

Bidders may watch the bid opening online using the following Web link:

https://financeonline.austintexas.gov/afo/afo_content.cfm?s=66&p=78

Disclaimer: The result of the bid opening does not become final until all bids are verified, and the bid tab is certified. The pencil bid tab and certified bid tab will be posted in Austin Finance Online at the following link:

https://financeonline.austintexas.gov/afo/account_services/solicitation/solicitations.cfm

ALL BIDS AND COMPLIANCE PLANS ARE DUE PRIOR TO (Austin time) 2:00 PM ON MAY 18, 2023.
BIDS WILL BE OPENED AT (Austin time) 3:00 PM ON MAY 18, 2023.

ALL BIDS AND COMPLIANCE PLANS NOT RECEIVED PRIOR TO THE DATE AND TIME SET FORTH ABOVE WILL NOT BE ACCEPTED FOR CONSIDERATION. The time stamp clock in SUITE 330 is the time of record and is verified with www.time.gov, the official U.S.

time. For Bids submitted electronically via Austin Finance Online, the time of record is the time received in Austin Finance Online.

4. VENDOR REGISTRATION AND NON-DISCRIMINATION

To create, edit, or submit an eResponse Bid, you must be logged in to your vendor account as the primary contact. You are eligible to submit an eResponse Bid after creating a user account and providing the business information of your organization. All CONTRACTORS must be registered to do business with OWNER prior to the Contract Award. All Subcontractors must be registered with the OWNER prior to execution of a contract. Prime Contractors are responsible for ensuring that their Subcontractors are registered as vendors with the City of Austin. Registration can be done through the OWNER's on-line Vendor Registration system. Log onto and follow directions:

https://financeonline.austintexas.gov/afo/afo_content.cfm?s=17.

The City of Austin, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

5. MBE/WBE PROCUREMENT PROGRAM

All City procurements are subject to the City's Minority-Owned and Women-Owned Business Enterprise Procurement Program found at Chapter 2-9-A of the City Code, as amended. The Program provides Minority-Owned and Women-Owned Business Enterprises (MBEs/WBEs) or Disadvantaged Business Enterprises (DBEs) full opportunity to participate in all City contracts. Goals for MBE/WBE or DBE participation are stated for each solicitation. Information on achieving the goals or documenting good faith efforts to achieve the goals are contained in the MBE/WBE Procurement Program Package or DBE Procurement Program Package attached to the solicitation. When goals are established, Bidders are required to complete and return the MBE/WBE or DBE Compliance Plan with their Bid. If a Compliance Plan is not submitted prior to the date and time set forth in the solicitation, the Bid will not be accepted for consideration. (See Section 00820 for MBE/WBE requirements on "no goal" solicitations.)

6. BID GUARANTY

All Bids shall be accompanied by an acceptable Bid guaranty in an amount of not less than five percent (5%) of the total Bid, as specified in Section 00100, Instructions to Bidders.

7. BONDS AND INSURANCE

Performance and payment bonds when required shall be executed on forms furnished by OWNER. Each bond shall be issued in an amount of one hundred percent (100%) of the Contract Amount by a solvent corporate surety company authorized to do business in the State of Texas, and shall meet any other requirements established by law or by OWNER pursuant to applicable law.

Minimum insurance requirements are specified in Section 00810, Supplemental General Conditions.

8. WAGE COMPLIANCE

Minimum wage rates have been established and are specified in Section 00830, Wage Rates and Payroll Reporting.

9. CONTRACT TIME

Contract Time is of the essence and all Work shall be substantially completed within three hundred sixty-five (365) Calendar Days after date specified in the Notice to Proceed, in accordance with the Bid Form, Section 00300.

Final completion shall be achieved within sixty (60) Calendar Days after substantial completion.

Liquidated damages are one thousand one hundred sixty dollars ($1,160) per Calendar Day for failure to substantially complete the work and three hundred seventy ($370) per Calendar Day for failure to achieve final completion within sixty (60) Calendar Days after substantial completion, in accordance with the Bid Form, Section 00300.

10. OWNER'S RIGHTS

OWNER reserves the right to reject any or all Bids and to waive any minor informality in any Bid or solicitation procedure (a minor informality is one that does not affect the competitiveness of the Bid).

11. PRE-BID CONFERENCE

A non-mandatory Pre-Bid Conference will be held on May 2, 2023, 10:00 am (Austin time), via webinar and teleconference. Bidders may participate in the virtual pre-bid conference by clicking this link: Pre-Bid Conference Click Here or by calling 512-831-7858 United States, Austin (Toll), Conference ID: 123 523 977#. For those calling in, please send an email to kenneth.kalu@austintexas.gov with the subject line CLMC974, indicate in the body of the email your name, the firm you are representing, your contact information and whether you are a prime firm or subcontractor. Please send this by 5:00 pm on the day of the virtual pre-bid meeting.

A non-mandatory Site-Visit will be held on May 3, 2023, 8:00 am (Austin time), at 500 East 12th Street, Austin, Texas.

Attendance is not mandatory unless otherwise stated. Bidders must attend any mandatory Site-Visit and are encouraged to attend any non-mandatory Site-Visit. If the Site-Visit is mandatory the Bidder must arrive and sign-in within fifteen (15) minutes of the scheduled start time of the Site-Visit, otherwise the Bidder will not be allowed to submit a Bid for the project.

12. ANTI-LOBBYING AND PROCUREMENT

On June 14, 2018, the Austin City Council adopted Ordinance No. 20180614-056 replacing Chapter 2.7, Article 6 of the City Code relating to Anti-Lobbying and Procurement. The policy defined in this Code applies to Solicitations for goods and/or services requiring City Council approval under City Charter Article VII, Section 15 (Purchase Procedures). The City requires Offerors submitting Offers on this Solicitation to certify that the Offeror has not in any way directly or indirectly had communication restricted in the ordinance section 2-7-104 during the No-Lobbying Period as defined in the Ordinance. The text of the City Ordinance is posted on the Internet at:

https://assets.austintexas.gov/purchase/downloads/New_ALO_Ordinance_No_20180614-056.pdf

13. AUTHORIZED CONTACT PERSONS

The persons listed below may be contacted for information regarding the Invitation for Bid.

PROJECT MANAGER:
Susan Kenzle
Phone: 512-284-1489
Email: susan.kenzle@austintexas.gov

CAPITAL CONTRACTING CONTACT:
Jeremiah Johnson
Phone: 512-974-3049
Email: jeremiah.johnson@austintexas.gov

SMALL & MINORITY BUSINESS RESOURCES DEPARTMENT CONTACT:
Kenneth Kalu
Phone: 512-974-7621
Email: kenneth.kalu@austintexas.gov

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INSTRUCTIONS TO BIDDERS
Section 00100

1. PREPARATION OF BID

1.1 Bid Documents. Each Bidder must prepare its Bid on forms furnished by OWNER or as otherwise specified or permitted. Blank spaces for each item in Bid form must be filled. Bidder must submit a price for each item in Bid. In case of conflict between unit prices and extensions, unit prices shall govern. The Bid must be executed in the complete and correct legal name of individual, partnership, firm, corporation or other legal entity constituting the Bidder.

1.2 Vendor Registration. To create, edit, or submit an eResponse Bid, you must be logged in to your vendor account as the primary contact. You are eligible to submit an eResponse Bid after creating a user account and providing the business information of your organization. All CONTRACTORS must be registered to do business with OWNER prior to Contract Award. All Subcontractors must be registered with the OWNER prior to execution of a contract. Prime Contractors are responsible for ensuring that their Subcontractors are registered as vendors with the City of Austin. Registration can be done through the OWNER's on-line Vendor Registration system. Log onto https://financeonline.austintexas.gov/afo/afo_content.cfm?s=17 and follow the directions.

1.3 Pre-Bid Conference. Unless otherwise notified, Bidders must attend the Pre-Bid Conference to ensure their understanding of OWNER's bidding and contracting requirements, particularly MBE/WBE Procurement Program requirements.

1.4 Sales Tax Exemption. The Owner is a tax-exempt organization as defined by Chapter 11 of the Property Tax Code of Texas. Bid prices shall not include sales tax on materials, supplies, or equipment that are incorporated into the real property interest of the OWNER or are otherwise completely used and consumed in the performance of the Contract. OWNER will furnish CONTRACTOR with a Sales Tax Exemption Certificate to be issued to Suppliers in lieu of the tax.

1.5 Minimum Wages. Workers on Project shall be paid not less than wage rates, including fringe benefits, as published by the Department of Labor (DOL) for Building Construction and Heavy and Highway Trades "AS APPLICABLE" and/or the minimum wage required by City of Austin Ordinance No. 20160324-015, whichever is higher. The Total Minimum Wage required can be met using any combination of cash and non-cash qualified fringe benefits provided the cash component meets or exceeds the minimum wage required.

1.6 Addenda. Bidder shall be knowledgeable of all Addenda issued and shall acknowledge all Addenda in spaces provided on Bid form. Further information regarding the Bid documents and the Project may be obtained from the Project Manager listed at the end of Section 00020, Invitation for Bids.

1.7 Required Items. Bids must include all specified items in this section and be submitted in accordance with paragraph No. 7 below. Any additional requirement to the bid submittal is specified in Section 00820. Any corrections to a Bid shall be initialed by the person signing the Bid.

1.8 Professional Services. Bidders must secure any required professional services that are defined as professional services under the Professional Services Procurement Act, Chapter 2254 of the Texas Government Code (for example: registered professional land

surveyors and professional engineers) using the qualifications based selection process prescribed by that chapter. (Note: It is a violation of State Law to solicit Bids for professional services.)

1.9 Further Information. Prospective Bidders desiring further information or interpretation of Project Manual or Drawings must make a written request for such information to OWNER addressed to the Authorized Contact Person listed in Section 00020 no later than seven (7) Working Days before Bid opening. Interpretation of Project Manual or Drawings will be made by Addendum only and obtained through the City's Vendor Connection website. Log on to:
https://financeonline.austintexas.gov/afo/account_services/solicitation/solicitations.cfm.
Any verbal communications will not be binding on the OWNER.

1.10 Anti-Lobbying and Procurement. Article 6, Chapter 2-7, City Code, repealed and replaced effective on June 25, 2018, prohibits lobbying activities or representations by Offerors during the No Lobbying Period as defined in the Ordinance.

1.10.1. FINDINGS; PURPOSE.

(A) The council finds that persons who enter a competitive process for a city contract voluntarily agree to abide by the terms of the competitive process, including the provisions of this article.

(B) The council finds that it is in the City's interest:

(i) to provide the most fair, equitable, and competitive process possible for selection among potential vendors in order to acquire the best and most competitive goods and services; and

(ii) to further compliance with State law procurement requirements.

(C) The council intends that:

(i) each response is considered on the same basis as all others; and

(ii) respondents have equal access to information regarding a solicitation, and the same opportunity to present information regarding the solicitation for consideration by the City.

1.10.2. APPLICABILITY.

(A) This article applies to all solicitations except:

(i) City social service funding;

(ii) City cultural arts funding;

(iii) federal, state or City block grant funding;

(iv) the sale or rental of real property;

(v) interlocal contracts or agreements; and

(vi) solicitations specifically exempted from this article by council.

(B) Absent an affirmative determination by the council, the purchasing officer has the discretion to apply this article to any other competitive process.

(C) City Code Section 1-1-99 (*Offenses; General Penalty*) does not apply to this article.

1.10.3. DEFINITIONS.

In this article:

(A) AGENT means a person authorized by a respondent to act for or in place of the respondent in order to communicate on behalf of that respondent. Each of the following is presumed to be an agent:

(i) a current full-time or part-time employee, owner, director, officer, member, or manager of a respondent;
(ii) a person related within the first degree of consanguinity or affinity to a current fulltime or part-time employee, owner, director, officer, member, or manager of a respondent;
(iii) a person related within the first degree of consanguinity or affinity to the respondent, if a respondent is an individual person; and Section 0200 V2, Solicitation Instructions 4 Rev. 06-26-2018
(iv) a lobbyist, attorney, or other legal representative of the respondent that has been retained by the respondent with respect to the subject matter of either the solicitation or the respondent's response to the solicitation.

(B) AUTHORIZED CONTACT PERSON means a City employee designated in a City solicitation as the point of contact for all purposes for that solicitation.
(C) CITY EMPLOYEE is defined in Section 2-7-2 (*Definitions*), and further includes an independent contractor hired by the City with respect to the solicitation.
(D) CITY OFFICIAL is defined in Section 2-7-2 (*Definitions*).
(E) NO-LOBBYING PERIOD means the period of time beginning at the date and time a solicitation is published and continuing through the earliest of the following:
(i) the date the last contract resulting from the solicitation is signed;
(ii) 60 days following council authorization of the last contract resulting from the solicitation; or
(iii) cancellation of the solicitation by the City
(F) PURCHASING OFFICER means the City employee authorized to carry out the purchasing and procurement functions and authority of the City.
(G) RESPONSE means a written offer or submission in reply to a solicitation.
(H) RESPONDENT means a person or entity that has timely submitted or subsequently timely submits a response to a City solicitation, even if that person subsequently withdraws its response or has been disqualified by the City for any reason. Respondent includes:
(i) a subsidiary or parent of a respondent;
(ii) a joint enterprise, joint venture, or partnership with an interest in a response and in which a respondent is a member or is otherwise involved, including any partner in such joint enterprise, joint venture, or partnership; and
(iii) a subcontractor to a respondent in connection with that respondent's response.
(I) SOLICITATION means an opportunity to compete to conduct business with the City that requires council approval under City Charter Article VII Section 15 (*Purchase Procedure*), and includes, without limitation:
(i) an invitation for bids;
(ii) a request for proposals;
(iii) a request for qualifications;
(iv) a notice of funding availability; and
(v) any other competitive solicitation process for which the purchasing officer, in the purchasing officer's sole discretion, affirmatively determines this article should apply in accordance with Section 2-B.

1.10.4. RESTRICTION ON LOBBYING.

Subject to the exclusions in Section 5 (*Permitted Communications*), during a no-lobbying period,

(A) a respondent or an agent shall not communicate directly with a City official or a City employee, or both in order to:

(i) provide substantive information about any respondent or response with respect to the solicitation to which the communication relates;

(ii) encourage the City to reject one or more of the responses to the solicitation to which the communication relates;

(iii) convey a complaint about the solicitation to which the communication relates; or

(iv) ask any City official or City employee to favor or oppose, recommend or not recommend, vote for or against, consider or not consider, or take action or refrain from taking action on any vote, decision, or agenda item regarding the solicitation to which the communication relates.

(B) a City official shall not contact or communicate with a respondent regarding a response or the solicitation to which the no-lobbying period applies;

(C) a City employee, other than the authorized contact person, shall not contact or communicate with a respondent regarding a response or the solicitation to which the no-lobbying period applies.

1.10.5. PERMITTED COMMUNICATIONS.

The following communications are permitted under this article at any time:

(A) any communication between a respondent or agent and any authorized contact person, including, without limitation and in accordance with regulation, any complaint concerning the solicitation;

(B) any communication between a respondent or agent and any person to the extent the communication relates solely to an existing contract between a respondent and the City, even when the scope, products, or services of the current contract are the same or similar to those contained in an active solicitation;

(C) any communication between a respondent or an agent and a City employee to the extent the communication relates solely to a non-substantive, procedural matter related to a response or solicitation;

(D) any communication required by or made during the course of a formal protest hearing related to a solicitation;

(E) any communication between a respondent or an agent and the City's Small & Minority Business Resources Department, that solely relates to compliance with Chapters 2-9A through 2-9D (*Minority-Owned and Women-Owned Business Enterprise Procurement Program*) of the City Code;

(F) any communication between an attorney representing a respondent and an attorney authorized to represent the City, to the extent the communication is permitted by the Texas Disciplinary Rules of Professional Conduct;

(G) any communication made by a respondent or an agent to the applicable governing body during the course of a meeting properly noticed and held under Texas Government Code Chapter 551 (*Open Meetings Act*);

(H) any communication between a respondent or an agent and a City employee whose official responsibility encompasses the setting of minimum insurance requirements for the solicitation to which the communication relates, to the extent the communication relates solely to the insurance requirements established by the City in the solicitation; and

(I) any contribution or expenditure as defined in Chapter 2-2 (*Campaign Finance*).

1.10.6. MODIFICATION OF RESTRICTION.

The purchasing officer may waive, modify, or reduce the requirements in Section 4 (*Restrictions on Lobbying*) in order to allow respondents to communicate with a City employee or a City official other than the authorized contact person when the purchasing officer determines, in writing, that the solicitation must be conducted in an expedited manner, including but not limited to a solicitation conducted for reasons of health or safety under the shortest schedule possible with no extensions. Any such modification authorized by the purchasing officer shall be stated in the solicitation.

1.10.7. NOTICE.

(A) Each solicitation shall include a notice advising respondents and prospective respondents:

(i) of the requirements of this article;

(ii) that any communication initiated by a City employee or City official, other than the authorized contact person, during the no-lobbying period regarding a response or the solicitation may result in a violation of Section 4(A) if the respondent subsequently lobbies that City employee or City official.

(B) The purchasing officer, or a City employee designated by the purchasing officer, shall provide weekly written notice, accessible to all City employees and City officials, of each solicitation for which the no-lobbying period is in effect.

1.10.8. DISCLOSURE OF VIOLATION.

A City official or a City employee other than the authorized contact person that becomes aware of a violation of Section 4 (*Restrictions on Lobbying*) shall notify the authorized contact person in writing as soon as practicable.

1.10.9. ENFORCEMENT.

(A) A respondent that has been disqualified pursuant to Section 10(A) (*Disqualification; Contract Voidable*) may appeal such disqualification to a subcommittee that is less than a quorum of the Ethics Review Commission established in Chapter 2-7, Article 2 (*Ethics Review Commission*), whose decision on appeal shall be final and binding. Any appeal must be filed in the manner prescribed by the Ethics Review Commission within 5 calendar days of the notice given by the purchasing officer pursuant to Section 10(B).

(B) The purchasing officer shall waive a violation of Section 4(A) if the violation was solely the result of communications initiated by a City official or a City employee other than the authorized contact person.

(C) The purchasing officer has the authority to enforce this article through rules promulgated in accordance with Chapter 1-2 (*Adoption of Rules*), which at a minimum shall include a notice and protest process for respondents disqualified pursuant to Section 10 (*Disqualification;Contract Voidable*), including:

(1) written notice of the disqualification imposed pursuant to Section 10 (*Disqualification;Contract Voidable*);

(2) written notice of the right to protest the disqualification imposed; and

(3) written notice of the right to request an impartial hearing process.

1.10.10. DISQUALIFICATION; CONTRACT VOIDABLE.

(A) If the purchasing officer finds that a respondent has violated Section 2-7-104(1), the respondent is disqualified from participating in the solicitation to which the violation related.

(B) The purchasing officer shall promptly provide written notice of disqualification to a disqualified respondent.

(C) If a respondent is disqualified from participating in a solicitation as a result of violating Section 2-7-104(1) and the solicitation is cancelled for any reason, that respondent is also disqualified from submitting a response to any reissue of the same or similar solicitation for the same or similar project. For the purposes of this section, the purchasing officer may determine whether any particular solicitation constitutes a "same or similar solicitation for the same or similar project".

(D) If a respondent violates Section 104(1) and is awarded a contract resulting from the solicitation to which the violation relates, the City may void that contract.

(E) Respondents that violate Section 2-7-104(1) three or more times during a five year period may be subject to debarment from participating in any new contracts with the City for a period of up to three years.

1.11 City's Minority-Owned and Women-Owned Business Enterprise / Disadvantaged Business Enterprise (MBE/WBE or DBE) Program Requirements.

Good Faith Efforts. When a bidder cannot achieve the MBE/WBE or DBE goals or subgoals established for the project, the bidder must document its Good Faith Efforts to meet the goals or subgoals. Good Faith Effort evaluations will consider, at a minimum, the bidder's efforts to do the following:

1.11.1 Soliciting through at least two reasonable, available and verifiable means MBEs/WBEs within the Significant Local Business Presence boundaries at least seven (7) business days prior to the bid opening date to allow the MBEs/WBEs or DBEs to respond to the bid.

1.11.2 Providing interested MBEs/WBEs or DBEs adequate information about the bid documents and requirements, including addenda, in a timely manner to assist them in responding to the bid.

1.11.3 Negotiating in good faith with interested MBEs/WBEs DBEs that have submitted bids to the bidder.

1.11.4 Publishing notice in a local publication such as a newspaper, trade association publication or via electronic/social media.

1.11.5 Not rejecting MBEs/WBEs or DBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities.

1.11.6 Making economically feasible portions of the work available to MBE/WBE or DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available MBE/WBE or DBE subcontractors and suppliers, so as to facilitate meeting the goals or subgoals.

1.11.7 The ability or desire of the bidder to perform the project work with its own

organization does not relieve the bidder of the responsibility to make Good Faith Efforts.

1.11.8 Bidders are not required to accept higher quotes in order to meet the goals or subgoals.

1.11.9 Effectively using the services of Minority Person/Women community organizations; Minority Person/Women Contractors groups; local, state and federal Minority Person/Women business assistance offices; and other organizations to provide assistance in solicitation and utilization of MBEs, WBEs and/or DBEs.

1.11.10 In assessing minimum Good Faith Efforts, the OWNER may consider (1) whether the bidder sought guidance from the City of Austin Small and Minority Business Resources Department (SMBR) on any question regarding compliance with these requirements; and (2) the performance of other bidders in meeting the goals.

For additional information, refer to the MBE/WBE or DBE Compliance Program Requirements Volume of the Project Manual.

Bid shopping is not allowed in conjunction with this solicitation and may result in the disqualification of prospective bidders and subcontractors.

2. ESTIMATES OF QUANTITIES (UNIT PRICE CONTRACTS ONLY)

Quantities listed in unit price Bid form are to be considered approximate quantities and will be used only for comparison of Bids. Payment to CONTRACTOR will be made only for actual quantities of Work performed or materials furnished in accordance with Contract and it is understood that quantities may be increased or decreased as provided in Section 00700, General Conditions, and as may be modified by Section 00810, Supplemental General Conditions.

3. DRAWINGS, PROJECT MANUAL AND SITE (S) OF WORK

Before submitting a Bid, the Bidder shall carefully examine the Bid Documents, site(s) of the proposed Work, soils, and other conditions that may affect the performance of the Work to satisfy the Bidder as to character, quality and quantities of Work to be performed and materials to be furnished. By submitting a Bid, the Bidder will be deemed to have certified that the Bidder has complied with these requirements. If, during preparation of the Bid, the Bidder discovers any suspected discrepancies or errors, the Bidder must immediately notify the Authorized Contact Person in writing of the suspected discrepancy or error. Failure to provide written notice of any suspected discrepancies or errors may be cause for rejection of the Bid.

4. BID GUARANTY

All Bids shall be accompanied by a Bid guaranty in an amount of not less than five percent (5%) of the total Bid. Bid guaranty will be a Bid bond with Power of Attorney attached, issued by a solvent surety authorized under laws of the State of Texas and acceptable to OWNER. For Bidders electing to submit Bids and Bid Guaranties electronically via Austin Finance Online, Bid Guaranties will be verified by the Owner prior to bid certification and electronic copies of Bid Guaranties will not be returned to Bidders.

The Bid guaranty accompanying the Bid of the three (3) apparent low Bidders will be retained until Contract is awarded and successful Bidder executes Contract and furnishes required

bonds and insurance, after which Bid guaranties will be returned to the Bidders. All other Bid guaranties will be returned after Bid certification. In the event that the Bidder to whom the Contract is awarded fails to execute the Contract within five (5) working days of receipt of a complete set of Contract Documents whether in electronic or hard copy form, the Bidder agrees that the OWNER in its discretion may rescind the initial award and award the Contract to the next lowest responsible Bidder.

5. PERFORMANCE AND PAYMENT BONDS

When performance and/or payment bonds are required, each shall be issued in an amount equal to the Contract Amount as security for the faithful performance and/or payment of all Contractor's obligations under the Contract Documents. Performance and payment bonds shall be issued by a solvent corporate surety authorized to do business in the State of Texas, and shall meet any other requirements established by law or by OWNER pursuant to applicable law.

6. CONSIDERATION OF BID AMOUNT

For purpose of award, after Bids are opened, reviewed, and certified, the total amount of the Bid, including accepted Bid alternates, will be considered the amount of the Bid. Certified Bid tabulations will be made available to the public through the City's Vendor Connection website, log on https://financeonline.austintexas.gov/afo/account_services/solicitation/solicitations.cfm. OWNER reserves the right to reject any or all Bids and to waive any minor informality in any Bid or solicitation procedure (a minor informality is one that does not affect the competitiveness of the Bids).

7. SUBMISSION OF BID

Each Bid must be completed and signed by person(s) authorized to bind individual, partnership, firm, corporation, or any other legal entity submitting the Bid, and, shall include the following in one envelope or electronically via Austin Finance Online eResponse:

7.1 One copy of Bid form (Section 00300L or 00300U) completed and signed.

7.2 Acknowledgment of receipt of Addenda issued in spaces provided in Bid form.

7.3 Required Bid guaranty (copy of Bid guaranty if submitted electronically via Austin Finance Online).

7.4 Required Information indicated in Drawings or Project Manual as specified in Section 00820.

7.5 One copy of Total Bid Form if bid is submitted electronically via Austin Finance Online.

Bid must be accompanied by an MBE/WBE or DBE Compliance Plan. Compliance Plans will either be submitted separately, in a second envelope or electronically via Austin Finance Online, prior to the date and time set forth in Section 00020, Invitation for Bids. The Compliance Plan forms are included in the MBE/WBE Procurement Program Package or DBE Procurement Program Package (a separately bound volume).

Bid shall include all specified items in this section submitted electronically via Austin Finance Online, or may be submitted to the Capital Contracting Office in a sealed envelope, clearly

identified on outside as a Bid to OWNER, with Bidder's company name and address, project name, bid due date/time, signed acknowledgement of the number of Addenda received and authorized signature. Failure to submit Bid appropriately may subject Bidder to disqualification.

Sealed Bids may be mailed using the address below:

Address for US Mail
City of Austin
Capital Contracting
505 Barton Springs Road, Suite 330
Austin, Texas 78704

NOTE: Bids must either be received and time stamped in the Capital Contracting location prior to the Due Date and Time or submitted electronically via Austin Finance Online. The time of record for those electronically submitted is the time received in Austin Finance Online. It is the responsibility of the Offeror to ensure that their Bid arrives at the reception desk at Capital Contracting or electronically prior to the time and date indicated. Arrival at the City's mailroom, mail terminal, or post office box will not constitute the Bid arriving on time.

It is the sole responsibility of the Bidder to ensure timely delivery of Bid. OWNER will not be responsible for failure of service on the part of the U.S. Post Office, courier services, or any other form of delivery service chosen by the Bidder. (See Section 00820, Modifications to Bidding Requirements and Contract Forms, for modifications to solicitations without MBE/WBE or DBE goals.)

In submitting its Bid, Bidder certifies that it has not lobbied the City or its officials, managers, employees, consultants, or contractors in such a manner as to influence or to attempt to influence the bidding process. In the event it reasonably appears that the Bidder influenced or attempted to influence the bidding process, the City may, in its discretion, reject the Bid.

8. WITHDRAWAL OF BID

A Sealed Bid may be withdrawn by a Bidder, provided an authorized individual of the Bidder submits a written request to withdraw the Bid prior to the time set for opening the Bids. For withdrawal of electronic bids see eResponse Instructions.

9. REJECTION OF BIDS

9.1 The following will be cause to reject a Bid:

9.1.1 Failure to submit Section 00300 (Bid Form) and signed by an individual empowered to bind the Bidder.

9.1.2 Bids which are not accompanied by acceptable Bid guaranty, with Power of Attorney attached, or a letter certifying the Bidder's ability to be bonded, from a surety company, in accordance with Paragraph 4 above.

9.1.3 More than one Bid for same Work from an individual, firm, partnership or corporation.

9.1.4 Evidence of collusion among Bidders.

9.1.5 Sworn testimony or discovery in pending litigation with OWNER which discloses misconduct or willful refusal by contractor to comply with subject contract or instructions of OWNER.

9.1.6 Failure to submit MBE/WBE or DBE Compliance Plan in accordance with the separately bound volume titled MBE/WBE Procurement Program Package or DBE Procurement Program Package.

9.1.7 Failure to have an authorized agent of the Bidder attend the mandatory Pre-Bid Conference, if applicable.

9.1.8 Bids received from a Bidder who has been debarred or suspended by OWNER's Purchasing Officer.

9.1.9 Bids received from a Bidder when Bidder or principals are currently debarred or suspended by Federal, State or City governmental agencies. (Applicable for Bid amounts equal to or in excess of $25,000.00).

9.1.10 Bids received from a Bidder, who is identified on a list maintained by the Texas Comptroller of Public Accounts as a company known to have contracts with or provide supplies or services to a foreign terrorist organization, unless otherwise exempted from sanctions by the United States government.

9.2 The following may be cause to reject a Bid:

9.2.1 Poor performance in execution of work under a previous City of Austin contract.

9.2.2 Failure to achieve reasonable progress on an existing City of Austin contract.

9.2.3 Default on previous contracts or failure to execute Contract after award.

9.2.4 Evidence of failure to pay Subcontractors, Suppliers or employees in accordance with Contract requirements.

9.2.5 Bids containing omissions, alterations of form, additions, qualifications or conditions not called for by OWNER, or incomplete Bids may be rejected. In any case of ambiguity or lack of clarity in the Bid, OWNER reserves right to determine most advantageous Bid or to reject the Bid.

9.2.6 Failure to acknowledge receipt of Addenda.

9.2.7 Failure to submit any of the items specified below in paragraph 11, "Submission of Post Bid Information".

9.2.8 Failure to identify a dollar amount (price) of a unit price(s) in the 00300U including all Bid Alternates in the Bid Form 00300U or 00300L.

9.2.9 Failure to submit post-Bid information within the allotted time(s) (see paragraph 11 for post-Bid requirements).

9.2.10 Failure to timely execute Contract after award.

9.2.11 Previous environmental violations resulting in fines or citations by a governmental entity (i.e. U.S. Environmental Protection Agency, Texas Commission on Environmental Quality, etc.).

9.2.12 Safety record as set forth in Section 00410, Statement of Bidder's Safety Experience.

9.2.13 Failure of Bidder to demonstrate the minimum experience required as specified in Section 00400 if that Section is included in the bidding documents.

9.2.14 Evidence of Bidder's lack of sufficient resources, workforce, equipment or supervision, if required by inclusion of appropriate attachments in Section 00400.

9.2.15 Evidence of poor performance on previous Projects as documented in Owner's project performance evaluations.

9.2.16 Unbalanced Unit Price Bid: "Unbalanced Bid" means a Bid, which includes a Bid that is based on unit prices which are significantly less than cost for some Bid items and significantly more than cost for others. This may be evidenced by submission of unit price Bid items where the cost are significantly higher/lower than the cost of the same Bid items submitted by other Bidders on the project.

10. PROTEST PROCEDURES

The OWNER's Chief Procurement Officer or designee has the authority to settle or resolve any claim of an alleged deficiency or protest. The procedures for notifying the City of an alleged deficiency or filing a protest are listed below. If you fail to comply with any of these requirements, the Chief Procurement Officer or designee may dismiss your complaint or protest.

10.1 Protest regarding the Solicitation (Pre-Submittal of Bid Protest). Any protest regarding the Solicitation by the City shall be filed no later than five (5) days prior to the due date and time for Bids. Any protest filed after that date which raises issues regarding the Solicitation will not be considered.

10.2 Protests regarding the evaluation of Bids. Any protest regarding the evaluation of Bids by the City shall be filed with the City no later than five (5) days after the notification of award recommendation is posted on Austin Finance Online, or notification that the protestor's status as a Bidder has changed, such as notification that a Bid has been found to be non-responsive or a Bidder has been found to be non-responsible. Any protest filed after such date which raises issues regarding the evaluation will not be considered. Bidders may only protest the evaluation of their Bid.

10.3 Protest Regarding Award of Contract (Post-Award Protest). Any protest regarding the award of the contract shall be filed no later than ten (10) days after the date of award. Any protest regarding the award of the contract filed after such date will not be considered.

10.4 You shall submit your protest in writing and it shall include the following information: (i) your name, address, telephone, and email address; (ii) the Solicitation number; (iii) the specific facts and/or law upon which the protest of the Solicitation or the award is based, including all pertinent documents and evidence thereto; and (iv) the form of relief requested.

10.5 Your protest shall be concise and presented logically and factually to help with the

City's review.

10.6 When the City receives a timely written protest, the Chief Procurement Officer or designee will determine whether the grounds for your protest are sufficient. If the Chief Procurement Officer or designee decides that the grounds are sufficient, the Chief Procurement Officer or designee will schedule a protest hearing, usually within five (5) working days. If the Chief Procurement Officer or designee determines that your grounds are insufficient, the City will notify you of that decision in writing.

10.7 The protest hearing is informal and is not subject to the Open Meetings Act. The purpose of the hearing is to give you a chance to present your case, it is not an adversarial proceeding. Those who may attend from the City are: representatives from the department that requested the purchase, the Department of Law, the Financial Services Department, and other appropriate City staff. You may bring a representative or anyone else that will present information to support the factual grounds for your protest with you to the hearing.

10.8 A decision will usually be made within fifteen (15) calendar days after the hearing.

10.9 The City will send you a copy of the hearing decision after the appropriate City staff has reviewed the decision.

10.10 When a protest is filed, the City usually will not make an award until a decision on the protest is made. However, the City will not delay an award if the City Manager or the Chief Procurement Officer or designee determines that the City urgently requires the supplies or Services to be purchased, or failure to make an award promptly will unduly delay delivery or performance. In those instances, the City will notify you and make every effort to resolve your protest before the award.

10.11 The protest shall be submitted in writing to the Authorized Contact Person – Capital Contracting Contact identified in the Invitation for Bids, Section 00020.

11. SUBMISSION OF POST BID INFORMATION

11.1 Prior to determination of the certified low Bidder, the three (3) apparent low Bidders must submit to OWNER the following information within three (3) business days of receipt of notice of apparent low Bidder status by the OWNER:

11.1.1 One copy of Attachments A-I and any other specifically designated Attachments of the Statement of Bidder's Experience (Section 00400), completed and signed. (Unless provided to the contrary in Section 00820 Modifications to Bidding Requirements and Contract Forms). (Note: OWNER reserves the right to solely determine whether the comparable experience documentation provided by the Bidder is sufficient and relevant to the Work described in the Contract Documents for the Bidder to be considered a responsible Bidder.)

11.1.2 One Copy of the Certificate of Non-Suspension or Debarment (Section 00405), completed and signed. (Applicable for Bid amounts equal to or in excess of $25,000.00.)

11.1.3 One copy of Section 00410, Statement of Bidder's Safety Experience, including required attachments, completed and signed.

11.1.4 One copy of the Title VI Assurances Appendix A (Section 00631), completed and signed.

11.1.5 One copy of the Title VI Assurance Appendix E (Section 00632), completed and signed.

11.1.6 One copy of Exhibit A Federal Provisions (Section 00810A) completed and signed. (Federal projects only)

11.1.7 Such other information as is required to evaluate Bid or Bidder.

11.2 Upon notification of status as certified low Bidder, Bidder shall submit the following information to OWNER within three (3) business days:

11.2.1 Confirmation Letters between Bidder and all subcontractor(s) and all supplier(s) identified in the MBE/WBE Compliance Plan.

11.2.2 Section 00425A, Insurance Cost Form. For ROCIP projects.

11.2.3 Section 00425B, Contractor Affidavit of Receipt and Provision of ROCIP Information, and Subcontractor Affidavit of Receipt and Provision of ROCIP Information (for Subcontractor(s) of all tiers identified in the MBE/WBE Compliance Plan). For ROCIP projects.

11.2.4 Such other information as required. In addition, the Bidder acknowledges and agrees that the failure to timely provide the additional information required by this section will result in a determination that, for the purposes of this solicitation, the Bidder has not provided sufficient information for the OWNER to be able to determine that the Bidder is a responsible Bidder.

12. AWARD AND EXECUTION OF CONTRACT

OWNER will process Bids expeditiously. Award of Contract will be to the lowest, responsible Bidder meeting all requirements of the Bid Documents. OWNER may not award Contract to a nonresident Bidder unless the nonresident underbids the lowest Bid submitted by a responsible resident Bidder by an amount that is not less than the amount by which a resident Bidder would be required to underbid the nonresident Bidder to obtain a comparable contract in the state in which the nonresident's principal place of business is located.

Award of Contract will occur within the period identified on the Bid form, unless mutually agreed between the parties. Capital Contracting Officer shall submit recommendation for award to the City Council for those project awards requiring City Council action. Contract will be signed by City Manager or his/her designee after award and submission of required documentation by Bidder. Contract will not be binding upon OWNER until it has been executed by both parties. OWNER will process the Contract expeditiously. However, OWNER will not be liable for any delays prior to the award or execution of Contract.

Upon contract award, the selected Bidder must submit either their existing or an updated personnel policy (on letterhead) documenting conformity with City Code, Chapter 5-4, § 5-4-2. If the company does not submit a copy of their personnel policy incorporating the non-discrimination policy, the City of Austin Nondiscrimination Policy (Section 00630) will be considered the Bidder's nondiscrimination policy.

In any case of ambiguity or lack of clarity in the Bid, OWNER reserves the right to determine the most advantageous Bid or to reject the Bid.

Notwithstanding anything in this Section 00100 to the contrary, the OWNER may award a contract for construction services in an amount of less than $100,000 to a bidder whose

principal place of business is in the City of Austin and whose bid is within 5% of the lowest bid price received from a bidder whose principal place of business is not within the City of Austin, if the City finds that the local bidder offers the City the best combination of contract price and additional economic development opportunities for the City created by the contract award including the employment of resident of the City and increased tax revenues to the City.

13. PARTNERING

In order to complete the Work in a manner that is most beneficial to the OWNER and CONTRACTOR, OWNER and CONTRACTOR may form a "Partnering Team", which will include the E/A, and any major Subcontractors. This partnering relationship will draw on the strength of all parties to identify and achieve mutual goals. The objectives of this partnering relationship are effective and efficient communication and Contract performance, which is intended to ensure that the Project is completed within budget, on schedule, and in accordance with the Drawings and Specifications and other Contract requirements. While the partnering relationship will be multilateral in makeup and participation will be totally voluntary, the OWNER and CONTRACTOR agree to cooperate and use reasonable good faith efforts to discuss and resolve any and all Project issues and disputes. Section 01100, Special Project Procedures and/or Section 01200, Project Meetings contain additional information regarding the intent of the partnering relationship and responsibilities of the entities entering into the partnering charter.

14. ROCIP REQUIREMENTS

If the insurance on this Project will be under the Rolling Owner Controlled Insurance Program (ROCIP), the Bidder is directed to Section 00810, Supplemental General Conditions, Section 00820, Modifications to Bidding Requirements and Contract Forms, and the Project Safety Manual included with these contract documents for information and bidding requirements.

The Insurance Cost Form, Section 00425A must be accurately completed and submitted by the certified low bidder as a post bid submittal to indicate insurance was removed from the Base Bid and Alternates. CONTRACTOR shall remove from the Bid the cost of insurance for the CONTRACTOR and Subcontractors of all tiers working on site.

The Rolling Owner Controlled Insurance Program Information, Section 00425B, Contractor Affidavit of Receipt and Provision of ROCIP Information and Subcontractor Affidavit of Receipt and Provision of ROCIP Information for subcontractor(s) of all tiers identified in the MBE/WBE Compliance Plan must be accurately completed and submitted by the certified low bidder as a post bid submittal. Subcontractor Affidavits must be submitted throughout the duration of the Contract as Subcontractor(s) are added.

15. SIGNATURE REQUIREMENTS

The Bid and any subsequent supporting Bid documents and Contract must be executed in the Bidder's full name and legal entity status by an authorized representative of the Bidder. Accordingly, a partnership/joint venture must file its partnership/joint venture agreement, a corporation must file its articles and bylaws, a limited liability company must file its certificate of organization and article of organization and regulations, and a limited partnership must file not only limited partnership agreement and the certificate of limited partnership, but also the documentation for its general partner, and any Bidder must file a copy of any assumed name certificate, or such limited portion of such documents reasonably

establishing signature authority.

16. CONTRACTOR EVALUATION

The Owner will review and evaluate the Contractor's Work and performance on the Project and provide the Contractor with a written Contractor Evaluation Report in accordance with City of Austin Administrative Rule R161-13.37. Rule R161-13.37 provides an appeal process. http://www.austintexas.gov/department/contract-management

17. TEXAS ETHICS COMMISSION CERTIFICATE OF INTERESTED PARTIES DISCLOSURE FORM

17.1 Definitions:

17.1.1 "Interested Party" – means a person who has a controlling interest in a Business Entity with whom the Owner contacts or who actively participates in facilitating the Contract or negotiating the terms of the Contract, including a broker, intermediary, adviser, or attorney for the Business Entity.

17.1.2 "Business entity" - includes an entity through which business is conducted with a governmental entity or state agency, regardless of whether the entity is a for-profit or nonprofit entity. The term does not include a governmental entity or state agency.

17.2 As a condition to entering the Contract, the Business Entity constituting the successful Bidder must provide a Texas Ethics Commission Certificate of Interested Parties Form to the Owner at the time the Business Entity/Bidder submits the signed Contract to the Owner in full compliance with the following requirements under which the successful Bidder shall:

17.2.1 Go to the Ethics Commission's website (www.ethics.state.tx.us),

17.2.2 Complete the "Interested Parties" information, in accordance with the requirements of the Texas Ethics Commission Rules published at Title 1, Part 2, Chapter 46, of the Texas Administrative Code and available on the referenced website,

17.2.3 Include the City's contract identification number,

17.2.4 Include a short description of the goods or services to be used by the City, and

17.2.5 Indicate whether each interested party has a controlling interest in the business entity, is an intermediary in the contract for which the disclosure is being filed, or both.

17.3 In accordance with the Commission Rules, the Certificate of Filing and completed Certificate of Interested Parties must be (i) printed, (ii) signed by an authorized agent of the business entity, and (iii) submitted to the City at the time of the submission of the signed contract to the City. The City then must notify the Ethics Commission in electronic format of receipt of the document within 30 days of contracting and the Commission will make the disclosure of interested parties available to the public on its website.

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City Manager
Austin, Texas

The undersigned, in compliance with the Invitation for Bids for construction of the following Project for the city of Austin, Texas:

Solicitation No.:	CLMC974
Project:	Waller Creek Tunnel Inlet Facility Wet Well Mechanical Screening System
CIP ID No.:	10878.007

Having examined the Project Manual, Drawings and Addenda, the site of the proposed Work and being familiar with all of the conditions surrounding construction of the proposed Project, having conducted all inquiries, tests and investigations deemed necessary and proper; hereby proposes to furnish all labor, permits, material, machinery, tools, supplies and equipment, and incidentals, and to perform all Work required for construction of the Project in accordance with the Project Manual, Drawings and Addenda within the time indicated.

BASE BID	.....	$

- The “Base Bid” amount must be used in the MBE/WBE Compliance Plan Summary Page to determine subcontractor participation levels for the established MBE/WBE procurement goals.

- The “Base Bid” amount becomes the Bidder’s “TOTAL BID” if allowances and/or alternates are not included.

Notes:
1. MINIMUM WAGES: Workers on Project shall be paid not less than wage rates, including fringe benefits, as published by the Department of Labor (DOL) for Building Construction and Heavy and Highway Trades “AS APPLICABLE” and/or the minimum wage required by City of Austin Ordinance No. 20160324-015, whichever is higher. The Total Minimum Wage required can be met using any combination of cash and non-cash qualified fringe benefits provided the cash component meets or exceeds the minimum wage required.

BID GUARANTY: A Bid guaranty must be enclosed with this Bid, as required in Section 00020, in the amount of not less than five percent (5%) of the total Bid. Following the Bid opening, submitted Bids may not be withdrawn for a period of one hundred twenty (120) Calendar Days. Award of Contract will occur within this period, unless mutually agreed between the parties. The Bid guaranty may become the property of the OWNER, or the OWNER may pursue any other action allowed by law, if:

- Bidder withdraws a submitted Bid within the period stated above;
- Bidder fails to submit the required post Bid information within the period specified in Section 00020 or 00100, or any mutually agreed extension of that period; or
- Bidder fails to execute the Contract and furnish the prescribed documentation (bonds, insurance, etc.) needed to complete execution of the Contract within five (5) Working Days after notice of award, or any mutually agreed extension of that period.

TIME OF COMPLETION: The undersigned Bidder agrees to commence work on the date specified in the written "Notice to Proceed" to be issued by the OWNER and to substantially complete construction of the improvements, as required by the Project Manual, Drawings and Addenda for the Work within three hundred sixty five (365) Calendar Days.

If a Substantial Completion date has been specified, the Bidder further agrees to reach Final Completion within sixty (60) Calendar Days after Substantial Completion as required by the Project Manual, Drawings and Addenda for the work.

The Bidder further agrees that should the Bidder fail to substantially and finally complete the Work within the number of days indicated in the Bid or as subsequently adjusted, Bidder shall pay the liquidated damages for each consecutive day thereafter as provided below; unless the OWNER elects to pursue any other action allowed by law.

WAIVER OF ATTORNEY FEES: In submitting the Bid, in consideration for the waiver of the Bidder's right to attorney's fees by the OWNER, the Bidder knowingly and intentionally agrees to and shall waive the right to attorney's fees under Section 271.153 of the Texas Local Government Code in any administrative proceeding, alternative dispute resolution proceeding, or litigation arising out of or connected to any Contract awarded pursuant to this solicitation process.

LIQUIDATED DAMAGES: The Bidder understands and agrees that the timely completion of the described Work is of the essence. The Bidder and OWNER further agree that the OWNER's actual damages for delay caused by failure to timely complete the Project are difficult, if not impossible to measure. However, with respect to the additional administrative and consultant costs to be incurred by OWNER, the reasonable estimate of such damages has been calculated and agreed to by OWNER and Bidder.

Therefore, the Bidder and the OWNER agree that for each and every Calendar Day the Work or any portion thereof, remains incomplete after the Substantial Completion date as established by the above paragraph, "Time of Completion", payment will be due to the Owner in the amount of one thousand one hundred sixty dollars ($1,160) per Calendar Day as liquidated damages, not as a penalty, but for delay damages to the OWNER.

If both Substantial and Final Completion dates have been specified, the Bidder and the OWNER further agree that for each and every Calendar Day the Work or any portion thereof, remains incomplete after the Final Completion date as established by the above paragraph, "Time of Completion", payment will be due to the OWNER in the amount of three hundred seventy dollars ($370) per Calendar Day as liquidated damages, not as a penalty, but for delay damages to the OWNER. Such amount shall be deducted by the OWNER from any Contract payment due.

In the event of a default or breach by the CONTRACTOR and demand is made upon the surety to complete the project, in accordance with the Contract Documents, the surety shall be liable for liquidated damages pursuant to the Contract Documents in the same manner as the CONTRACTOR would have been.

MINOR INFORMALITY: OWNER reserves the right to reject any or all Bids and to waive any minor informality in any Bid or solicitation procedure (a minor informality is one that does not affect the competitiveness of the Bidders).

ADDENDUM: The undersigned acknowledges receipt of the following addenda:

Addendum No. 1 dated		Received	
Addendum No. 2 dated		Received	
Addendum No. 3 dated		Received	
Addendum No. 4 dated		Received	

BID DOCUMENT EXECUTION AND ACKNOWLEDGEMENT: The undersigned Bidder certifies that the Bidder has read and understands Section 00020 Invitation for Bids, Section 00100 Instructions to Bidders, and all other requirements applicable to the Bidding process provided in the Bid and Contract Documents.

BIDDER's CERTIFICATION OF NON-COLLUSION, NON-CONFLICT OF INTEREST, AND ANTI-LOBBYING (Section 00440): The undersigned Bidder, by its signature, represents and certifies that it has read and can affirmatively swear and subscribe to the statements in Section 00440 Non-Collusion, Non-Conflict of Interest, and Anti-Lobbying Certification. If the Bidder cannot affirmatively swear and subscribe to any of the statements in Section 00440, Bidder represents and certifies that it has provided a detailed written explanation with its Bid on separate pages annexed hereto. The undersigned Bidder further certifies that it has not in any way directly or indirectly had communication restricted in the City Code Chapter 2-7, Article 6 (Anti-Lobbying and Procurement) during the No-Lobbying Period as defined in Chapter 2-7.

BIDDER's CERTIFICATION AS TO NONRESIDENT PROVISIONS: Bidder must provide the following information in accordance with Vernon's Texas Statutes and Codes Annotated Government Code § 2252.002, as amended. A Texas Resident Bidder is a bidder whose principal place of business is in Texas and includes a Contractor whose ultimate parent company or majority owner has its principal place of business in Texas. The undersigned Bidder certifies that Bidder is a resident of _____ (*Bidder must write in the blank the state of which Bidder is a resident*).

Bidder will initial the blank set forth below to represent and certify that the Bidder has completed, executed, and enclosed the corresponding Bid Documents with the Bid.

____ MBE/WBE Compliance Document

____ One copy of Total Bid Form if Bid is submitted electronically via Austin Finance Online

____ Bid Guaranty

The undersigned, by their signature, represents that they are submitting a binding offer and are authorized to bind the respondent to fully comply with the solicitation documents contained herein. The Respondent, by submitting and signing below, certifies that they have received and read all sections of the entire solicitation document including all revisions, addenda and documents incorporated by reference, and agree to be bound by the terms therein.

_____ _____
Corporate Secretary, *if Bidder is a Corporation Bidder

_____ _____
Email for Secretary Authorized Signature/Print Name

_____
(Seal) Title

_____
Date

_____

_____
Address

_____
Telephone Number / FAX Number

_____
Email for Person Signing Bid

_____
Email for Bidder's Primary Contact Person

END

TOTAL BID FORM

Solicitation No.:	CLMC974
Project:	Waller Creek Tunnel Inlet Facility Wet Well Mechanical Screening System
Bidder:	
Total Bid Amount: (includes Base Bid plus any Allowances or Alternates shown in Section 00300)	

Notes:

1. This form will be displayed publicly in Austin Finance Online approximately one hour after the solicitation closes.
2. In the case of discrepancies between this form and Section 00300, Section 00300 takes precedence.

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STATEMENT OF BIDDERS EXPERIENCE
Section 00400

Project Name:	Waller Creek Tunnel Inlet Facility Wet Well Mechanical Screening System
Name of Bidder:	
Solicitation Number:	CLMC974

Bidder must complete all Attachments to Section 00400 clearly and comprehensively. If necessary, responses may be continued on separately attached sheets.

To be considered a responsive and responsible bidder, the apparent three (3) low Bidders must complete and submit within three (3) working days of notification of low bidder status Attachments A through I in accordance with Article 11, Section 00100. Contractor Performance Evaluations for previous work with the City will be included in the assessment of the Bidder's experience. Any information in Attachments A through I and in the Contractor's Performance Evaluations that indicates the Bidder or a "Subcontractor" is not responsible or that might negatively impact a Bidder's ability to complete the Work within the Contract Time and for the Contract Price may result in the Bid being rejected.

The Bidder is responsible for the accuracy and completeness of all of the information provided by the Bidder or a proposed Subcontractor in response to this Invitation for Bids.

POST-BID SUBMITTALS

ATTACHMENT A – BIDDER'S INFORMATION

ATTACHMENT B – EXPERIENCE REQUIREMENTS (GENERAL CONTRACTOR)

ATTACHMENT C – PROJECT MANAGER AND SUPERINTENDENT EXPERIENCE

ATTACHMENT D – EXPERIENCE REQUIREMENTS (SPECIFIC CONSTRUCTION OR TECHNICAL EXPERIENCE)

ATTACHMENT E – AVAILABLE EQUIPMENT

ATTACHMENT F – AVAILABLE WORKFORCE

ATTACHMENT G – CURRENT PROJECTS

ATTACHMENT H – COMPLETED PROJECTS

ATTACHMENT I – BIDDER'S AUTHENTICATION

ATTACHMENT A
BIDDER'S INFORMATION

Attention Bidder: Complete and return within three (3) days of notification of the three (3) low bidders' status.

Solicitation Number:	CLMC974

A.	Name of Bidder:	
B.	Bidder's Permanent Address:	
C.	Bidder's Phone Number:	
D.	Number of years in business under current company name:	

(Note: Bidder must have been in existence for a minimum of one (1) year under its current company name. Changes in company name during the experience period are acceptable, if the continuity of the company can be demonstrated. Attach separate documentation, if applicable.)

If Bidder answers "Yes" for <u>any</u> of questions E through H, Bidder must attach separate sheets with a brief description or explanation of the answer and provide pertinent contact information (parties' names, addresses and telephone numbers).

E.	Has the Bidder ever defaulted on a contract?	❒ Yes	❒ No
F.	Are there currently any pending judgements, claims, or lawsuits against the Bidder?	❒ Yes	❒ No
G.	Does Bidder currently have any pending claims, judgements or lawsuits against any prior client?	❒ Yes	❒ No
H.	Is the Bidder or its principals involved in any bankruptcy or reorganization proceedings?	❒ Yes	❒ No

ATTACHMENT B
EXPERIENCE REQUIREMENTS (GENERAL CONTRACTOR)

Attention Bidder: Complete and return within three (3) days of notification of the three (3) low bidders' status.

Solicitation Number:	CLMC974

GENERAL CONTRACTOR EXPERIENCE:

Bidder must list and describe Bidder's (not proposed subcontractors') construction experience as a general contractor for a minimum of three (3) successfully completed projects of comparable size, scope and complexity to the Work described in the Contract Documents. Bidder should refer to the Work description in Section 01010 Summary of Work and Section 00020/00020 IDIQ to determine what is reasonably comparable. Comparability requirements may be spread among the three (3) projects submitted, e.g. One Project may demonstrate comparable size, another Project may demonstrate comparable scope and another may demonstrate comparable complexity. Decisions on "comparability" are at the complete discretion of the OWNER.

Bidder must have completed the projects within the past ten (10) years.

Attention Bidder: Duplicate this form for each of the three (3) projects.

PROJECT NO. _____		
Name of Project:		
Location:		
OWNER's Name and Address:		
OWNER's Contact Person (Print):		
Phone		
Initial Contract Price:		
Final Contract Price:		
Contract Start Date: *(Date of Notice to Proceed)*		
Contract Time:	Calendar Days:	Working Days:
Contract Substantial Completion Date:		
Actual Substantial Completion Date:		
If contract time extensions were added to the contract as a result of Bidder's responsibilities, provide a short explanation of each:		
Project Description and why it is comparable to this Contract:		

ATTACHMENT C
PROJECT MANAGER & SUPERINTENDENT EXPERIENCE

Attention Bidder: Complete and return within three (3) days of notification of the three (3) low bidders' status.

Name of Bidder:	
Solicitation Number:	CLMC974

Bidder must attach resumes for the Project Manager and Superintendent who will be assigned to this project. The resumes must demonstrate that these individuals have worked on at least three (3) similar, successfully completed projects in the capacity of Project Manager or Superintendent, or other responsible supervisory capacity, as applicable, during the last 10 years.

Project Manager (name): _____

Superintendent (name): _____

Note: Attach Resumes & Experience

Attention Bidder: Complete and return within three (3) days of notification of the three (3) low bidders' status.

SPECIFIC CONSTRUCTION EXPERIENCE (GENERAL CONTRACTOR OR SUBCONTRACTOR PERFORMING THE WORK)

Bidder must provide the following project history information for each Construction Experience requirement listed below. OWNER may in its reasonable discretion deem the provided experience information insufficient and reject the Bid.

For each Construction Experience item listed below, list and describe the applicable Construction Experience for a minimum of three (3) successfully completed projects of comparable size, scope, and complexity to the Work described for this project. Comparability requirements may be spread among the three (3) projects per item submitted, e.g. One Project may demonstrate comparable size, another Project may demonstrate comparable scope and another may demonstrate comparable complexity. Decisions on "comparability" are at the complete discretion of the OWNER.

The Work must have been performed within the past ten (10) years.

Bidder must provide all requested information in a complete, clear, and accurate manner. If necessary, additional information may be provided on separate attached sheets. Failure to provide any requested information may cause the Bid to be rejected by OWNER as non-responsive.

If the Bidder proposes to fulfill any specific construction experience requirement with subcontracted resources, the applicable Subcontractor must be included in the Bidder's Original MBE/WBE Compliance Plan. Failure to include subcontractors on the MBE/WBE Compliance Plan may render your bid non-responsive.

SPECIFIC CONSTRUCTION EXPERIENCE ITEMS REQUIRED:

ITEM 1. Furnish and/or installation of a multi-rake mechanical screen cleaning mechanism situated with an active channel with water flow.

ITEM 2. Furnish and/or installation of submersible pumps and associated piping and appurtenances.

ITEM 3. Furnish and/or installation of an irrigation skid that includes variable frequency drives, pressure switch and packaged controls.

ITEM 4. Experience working within an active municipal facility requiring regular communication with operating staff and minimal disruption to daily operations.

The Bidder shall complete and duplicate the following specific Construction Experience Form as required to provide the requested documentation for a minimum of three (3) successfully completed projects for each of the above specific Construction Experience requirements. A project may demonstrate experience with multiple experience items.

CONSTRUCTION EXPERIENCE DOCUMENTATION FORM		
EXPERIENCE ITEM NUMBER:		
Project Number:		
Does Bidder plan to self-perform this work?	☐ Yes	☐ No
If "NO", provide the following Subcontractor's information:		
Company's Address:		
Permanent Address:		
Phone No.		
# of years Subcontractor has been in business under current company name:		
Name of Project:		
Location:		
OWNER's Name:		
OWNER's Address:		
OWNER's Contact Person (Print):		
Phone/Fax No.:		
Initial Contract Price:		
Final Contract Price:		
Contract Start Date: *(Date of Notice to Proceed)*		
Contract Time:	Calendar Days:	Working Days:
Contract Substantial Completion Date:		
Actual Substantial Completion Date:		
If contract time extensions were added to the contract as a result of Bidder's responsibilities, provide a short explanation of each:		
Project Description and why it is comparable to this Contract:		

ATTACHMENT E
AVAILABLE EQUIPMENT LIST

Attention Bidder: Complete and return within three (3) days of notification of the three (3) low bidders' status.

Name of Bidder:	
Solicitation Number:	CLMC974

Provide a list of equipment that is available to the CONTRACTOR or its Subcontractor(s) and is specifically intended to be used on the Work under this Contract. Also indicate whether the equipment is owned or will be leased by the CONTRACTOR and/or Subcontractor(s).

EQUIPMENT	OWNED OR LEASED	COMMITTED TO ANOTHER PROJECT? (Yes / No)	AVAILABLE / RELEASE DATE

Use additional pages, as necessary

ATTACHMENT F
AVAILABLE WORKFORCE

Attention Bidder: Complete and return within three (3) days of notification of the three (3) low bidders' status.

Name of Bidder:	
Solicitation Number:	CLMC974
CIP ID Number:	10878.007

Provide a list of the available workforce for the various disciplines and crafts required for the Work on this Project, including the number of work crews, and number and worker classification for each equipment operator, mechanic, and laborer for that portion of the Work that Bidder will actually perform.

Number of Anticipated Work Crews: _____

DISCIPLINE OR CRAFT	NO. OF EMPLOYEES	COMMITTED TO ANOTHER PROJECT? (Yes / No)	AVAILABLE / RELEASE DATE
Professional (specify)			
Superintendent			
Technical (specify)			
Skilled Workers (specify)			
Semiskilled Workers (specify)			
Equipment Operators (list)			
Other			

Use additional pages, as necessary

ATTACHMENT G
CURRENT PROJECT LISTING (INCLUDING ALL CITY OF AUSTIN PROJECTS)

Attention Bidder: Complete and return within three (3) days of notification of the three (3) low bidders' status.

Name of Bidder:	
Solicitation Number:	CLMC974
CIP ID Number:	10878.007

Provide a list of all current projects, including *all City of Austin projects*. Include the following for all jobs that Bidder is currently committed to or has currently underway: brief statement regarding the job type; estimated project duration; project contact; and project description.

Name of Project:		
Location:		
Type of Job:		
City of Austin Job?	☐ Yes	☐ No
Project Start Date		
Estimated Completion Date:		
Project Contact:		
Brief Description:		

Name of Project:		
Location:		
Type of Job:		
City of Austin Job?	☐ Yes	☐ No
Project Start Date		
Estimated Completion Date:		
Project Contact:		
Brief Description:		

ATTACHMENT H
COMPLETED PROJECTS (INCLUDING ALL CITY OF AUSTIN PROJECTS)

Attention Bidder: Complete and return within three (3) days of notification of the three (3) low bidders' status.

Name of Bidder:	
Solicitation Number:	CLMC974
CIP ID Number:	10878.007

Provide a list of all completed projects, including all City of Austin projects that Bidder has completed in the past five (5) years by calendar year (or life of company if less than five (5) years). Include the following: a brief statement regarding the job type, the estimated project duration, project contact, and project description.

Calendar Year of _____

Name of Project:		
Location:		
Type of Job:		
City of Austin Job?	☐ Yes	☐ No
Project Duration:		
Project Contact:		
Brief Description:		

Name of Project:		
Location:		
Type of Job:		
City of Austin Job?	☐ Yes	☐ No
Project Duration:		
Project Contact:		
Brief Description:		

Use additional pages as necessary to achieve a representative listing covering 5 years

ATTACHMENT I
BIDDERS AUTHENTICATION

(Attention Bidder: Complete and return within three (3) days of notification of the three (3) low bidders' status)

Solicitation Number:	CLMC974
CIP ID Number:	10878.007

THE STATE OF TEXAS
COUNTY OF TRAVIS

I certify that my responses and the information provided in Attachments A-H are true and correct to the best of my personal knowledge and belief and that I have made no willful misrepresentations in this Section, nor have I withheld any relevant information in my statements and answers to questions. I am aware that any information given by me in this Section may be investigated and I hereby give my full permission for any such investigation and I fully acknowledge that any misrepresentations or omissions in my responses and information may cause my bid to be rejected.

Bidder's full name and entity status:

_____
Company's Name

_____
Signature, Authorized Representative of Bidder

_____
Title

_____
Date

END

CERTIFICATE OF NON-SUSPENSION OR DEBARMENT

Section 00405

Solicitation Number: _____ (to be filled in by Contractor)

The City of Austin is prohibited from contracting with or making prime or sub-awards to parties that are suspended or debarred or whose principals are suspended or debarred from Federal, State, or City of Austin Contracts. Covered transactions include procurement contracts for goods or services equal to or in excess of $25,000.00 and all non-procurement transactions. This certification is required for all bidders on all City of Austin Contracts to be awarded with values equal to or in excess of $25,000.00 and all non-procurement transactions.

The CONTRACTOR hereby certifies that its firm and its principals are not currently suspended or debarred from bidding on any Federal, State, or City of Austin Contracts.

Contractor's full name and entity status:

_____

_____

(Name/Signature of Authorized Official)

_____

Title

_____

Date

END

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BIDDER'S SAFETY EXPERIENCE
(To Be Submitted Post-Bid)

Solicitation Number: _____ (to be filled in by Contractor)

NAME OF BIDDER: _____

Pursuant to Section 252.0435 of the Local Government Code, the OWNER will consider the safety records of bidders prior to awarding a City contract. Upon request, a bidder is required to provide information to demonstrate the safety and health performance of their company. The information obtained from a bidder or from other sources will be used to determine the bidder's safety record, and will not automatically be used to exclude the bidder from selection for this or any future procurement. The OWNER will consider the responses to this Section 00410 document separately when making a discretionary determination of whether to disqualify a bidder, and may also consider the cumulative impact of the information generated by the bidder's responses in making the determination. Bidders are responsible for reviewing the safety records of proposed subcontractors.

Upon notification from the OWNER, the three (3) apparent low bidders are required to provide the following information:

<table>
<tr><th colspan="4">WORKERS' COMPENSATION EXPERIENCE MODIFICATION RATE DATA</th></tr>
<tr><td rowspan="6">Provide bidder's Workers' Compensation Experience Modification Rate (EMR)
Data using the loss experience that occurred within the past five years.

Attach bidder's NCCI workers compensation experience rating sheets for the past five (5) years.</td><td></td><td>Policy Year</td><td>EMR</td></tr>
<tr><td>Current EMR:</td><td></td><td></td></tr>
<tr><td>1 Year Ago:</td><td></td><td></td></tr>
<tr><td>2 Years Ago:</td><td></td><td></td></tr>
<tr><td>3 Years Ago:</td><td></td><td></td></tr>
<tr><td>4 Years Ago:</td><td></td><td></td></tr>
<tr><td colspan="4">Bidder's initialing here certifies that bidder does not have an EMR: _____

(Submit a copy of bidder's Insurance Loss Run Reports for the last five years if bidder does not have an EMR.)</td></tr>
<tr><td colspan="4">Bidder may include additional information explaining any circumstances that may have affected the company's EMR rate.</td></tr>
<tr><td colspan="4">Evaluation: Bidders with a 5-year EMR average that exceeds the 5-year industry average EMR by more than 25% may be deemed non-responsive.</td></tr>
</table>

REGULATORY NOTICE AND CITATION HISTORY DATA	
Provide bidder's information regarding regulatory **OSHA and/or Environmental Protection Agency Notices and Citations** as follows: Describe federal, state, city/municipal or county OSHA notices of noncompliance or citations issued to or received by the bidder within the past three years or any notices from any environmental protection agency, including any notices or citations from any state agency or local government responsible for enforcing environmental protection or other health and safety laws or regulations of any state of the United States, received within the past three years.	**Provide a description of each on the OSHA/EPA form on the following page to include:** • Date of Citation/Notices • Issuing agency • Standard cited • Level of violation (i.e. serious, willful) • Dates and brief description(s) of the event(s) • Brief description(s) of actions taken to correct the violation(s) • Current status (Open, Closed, Contested) • If Closed, date of Closure • If Open, estimated date of Closure
Bidder may include additional information explaining any related circumstances.	
Evaluation: Information may be verified by referring to respective agency. More than two serious or more than one willful or repeated violation (investigation completed) within the past three years may deem the Bidder non-responsive.	

OSHA and/or Environmental Protection Agency Notices Within Past Three Years						
Date of Citation or Notice	Issuing Agency	Violation Level (i.e. serious, willful)	Brief description of event	Brief description of actions taken to correct violation(s)	Current Status (Open, Closed, Contested)	Closed Date, or if Open, estimated Close Date

INJURY AND ILLNESS INCIDENCE RATE DATA	
Provide bidder's ***Total Case Incidence Rate(s) (TCIR)** for the 3 most recent calendar years. Attach bidder's OSHA 300 and 300A logs for the past 3 years.	**TCIR Rates:** Current Rate: _____ 1 Year Ago: _____ 2 Years Ago: _____
DAYS AWAY, RESTRICTED, AND TRANSFER RATE DATA	
Provide bidder's ****Days Away, Restricted, and Transfer Rate(s) (DART)** for the three most recent calendar years.	**DART Rates:** Current Rate: _____ 1 Year Ago: _____ 2 Years Ago: _____
Bidder may include additional information explaining any circumstances that may have affected the submitted rates and/or their associated three year trends.	
Evaluation: Rates will be compared to the most recently published Bureau of Labor Statistics (BLS) national average for the Standard Industrial Classification code (SIC) or North American Industrial Classification Systems (NAICS) code for the construction industry. For consideration of another code within the construction industry, the Bidder must provide the code and justification. Bidders with a 3-year TCIR or DART average that exceeds the 3-year TCIR or DART industry average may be deemed non-responsive.	

**TCIR – To calculate the calendar year TCIR, determine the total number of all recordable injuries and illnesses that occurred during the year in question, divide that total by the total number of hours worked by all employees during that year, and multiply the result by 200,000.*

*** DART – To calculate the calendar year DART, determine the total number of recordable injuries and illnesses resulting in days away from work, restricted work activity, and/or job transfer that occurred during the year in question, divide that total by the total number of hours worked by all employees during that year, and multiply the result by 200,000.*

ACKNOWLEDGEMENT

THE STATE OF TEXAS

COUNTY OF TRAVIS

I certify that my responses and the information I have provided are true and correct to the best of my personal knowledge and belief and I have made no willful misrepresentations in this, or withheld any relevant information in my statements. I am aware that any information given by me in response to this Section 00410 may be investigated and I hereby give my full permission for any such investigations, and I fully acknowledge that any misrepresentations or omissions in my responses and information may cause my bid to be rejected or cause any contract based on misrepresentations to be cancelled.

Contractor's full name and entity status:

_____

_____
(Name/Signature of Authorized Official)

_____
Title

_____
Date

END

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NON-COLLUSION, NON-CONFLICT OF INTEREST AND ANTI-LOBBYING

State of Texas

County of Travis

The term **"Bidder"**, as used herein, includes the individual or business entity submitting the bid includes the directors, officers, partners, managers, members, principals, owners, agents, representatives, employees, other parties in interest of the Bidder, and anyone or any entity acting for or on behalf of the Bidder, including a subcontractor in connection with this bid.

The terms **"City"** and **"Owner"** are synonymous.

1. **Anti-Collusion Statement.** The Bidder has not and will not in any way directly or indirectly:

   a. colluded, conspired, or agreed with any other person, firm, corporation, bidder or potential bidder to the amount of this bid or the terms or conditions of this bid.
   b. paid or agreed to pay any other person, firm, corporation bidder or potential bidder any money or anything of value in return for assistance in procuring or attempting to procure a contract or in return for establishing the prices in the attached bid or the bid of any other bidder.

2. **Preparation of Invitation for Bid and Contract Documents**. The Bidder has not received any compensation or a promise of compensation for participating in the preparation or development of the underlying bid or contract documents., In addition, the Bidder has not otherwise participated in the preparation or development of the underlying bid or contract documents, except to the extent of any comments or questions and responses in the bidding process, which are available to all bidders, so as to have an unfair advantage over other bidders, provided that the Bidder may have provided relevant product or process information to a consultant in the normal course of its business.

3. **Participation in Decision Making Process.** The Bidder has not participated in the evaluation of bids or proposals or other decision making process for this solicitation, and, if Bidder is awarded a contract hereunder, no individual, agent, representative, consultant or sub contractor or consultant associated with Bidder, who may have been involved in the evaluation or other decision making process for this solicitation, will have any direct or indirect financial interest in the Contract, provided that the Bidder may have provided relevant product or process information to a consultant in the normal course of its business.

4. **Present Knowledge.** Bidder is not presently aware of any potential or actual conflicts of interest regarding this solicitation, which either enabled Bidder to obtain an advantage over other bidders or would prevent Bidder from advancing the best interests of OWNER in the course of the performance of the Contract.

5. **City Code.** As provided in Sections 2-7-61 through 2-7-65 of the City Code, no individual with a substantial interest in Bidder is a City official or employee or is related to any City official or employee within the first or second degree of consanguinity or affinity.

6. **Chapter 176 Conflict of Interest Disclosure.** In accordance with Chapter 176 of the Texas Local Government Code, the Bidder:

   a. does not have an employment or other business relationship with any local government officer of OWNER or a family member of that officer that results in the officer of family member receiving taxable income;
   b. has not given a local government officer of OWNER one or more gifts, other than gifts of food lodging transportation or entertainment accepted as a guest, that have an aggregate value of more than $100 in the twelve-month period preceding the date the officer becomes aware of the execution of the Contract or that OWNER is considering doing business with the Bidder; and
   c. does not have a family relationship with a local government officer of OWNER in the third degree of consanguinity or the second degree of affinity.

   As required by Chapter 176, Bidder must file the Conflicts of Interest Questionnaire with the Purchasing Department no later than the seventh business day after the commencement of contract discussions or negotiations with the City or the submission of a Bid, response to a request for proposals, or other writing related to a potential contract with OWNER. The questionnaire must be updated not later than the seventh day after the date of an event that would make a statement in the questionnaire inaccurate or incomplete. There are statutory penalties for failure to comply with Chapter 176.

7. **Anti-Lobbying Ordinance.** On June 14, 2018, the Austin City Council adopted Ordinance No. 20180614-056 replacing Chapter 2.7, Article 6 of the City Code relating to Anti-Lobbying and Procurement. The policy defined in this Code applies to Solicitations for goods and/or services requiring City Council approval under City Charter Article VII, Section 15 (Purchase Procedures). The City requires Offerors submitting Offers on this Solicitation to certify that the Offeror has not in any way directly or indirectly had communication restricted in the ordinance section 2-7-104 during the No-Lobbying Period as defined in the Ordinance. The text of the City Ordinance is included in Section 00100 of this solicitation and is also posted on the Internet at:

   https://assets.austintexas.gov/purchase/downloads/New_ALO_Ordinance_No_20180614-056.pdf

8. Pursuant to Texas Government Code §2271.002, the City is prohibited from contracting with any "company" for goods or services unless the following verification is included in this Contract.

   A. For the purposes of this Section only, the terms "company" and "boycott Israel" have the meaning assigned by Texas Government Code §2271.001.
   B. If the Bidder qualifies as a "company," then Bidder verifies that it:
      i. does not "boycott Israel"; and
      ii. will not "boycott Israel" during the term of this Contract.
   C. Bidder's obligations under this Section, if any exist, will automatically cease or be reduced to the extent that the requirements of Texas Government Code Chapter 2271 are subsequently repealed, reduced, or declared unenforceable

or invalid in whole or in part by any court or tribunal of competent jurisdiction or by the Texas Attorney General, without any further impact on the validity or continuity of this Contract.

9. Bidder certifies that it is aware of City Council Resolution No. 20191114-056, which prohibits the City from contracting with entities that engage in certain practices related to conversion therapy. By bidding and accepting this Contract, the Bidder agrees that: (1) its firm and its principals are not currently and will not during the term of the Contract engage in practicing LGBTQ+ conversion therapy; referring persons to a healthcare provider or other person or organization for LGBTQ+ conversion therapy; or contracting with another entity to conduct LGBTQ+ conversion therapy; and that (2) if the City determines in its sole discretion that Bidder has during the term of this Contract engaged in any such practices, the City may terminate this Contract without penalty to the City.

10. Pursuant to Texas Government Code Chapter 2274, Bidder certifies that if it has or will have remote or direct access to communication infrastructure systems, cybersecurity systems, the electric grid, hazardous waste treatment systems, or water treatment facilities as a result of any City contract, that Bidder is not:

A. owned by or the majority of stock or other ownership interest of its firm is not held or controlled by:

i. individuals who are citizens of China, Iran, North Korea, Russia, or a Governor-designated country; or
ii. a company or other entity, including a governmental entity, that is owned or controlled by citizens of or is directly controlled by the government of China, Iran, North Korea, Russia, or a Governor-designated country; or
iii. headquartered in China, Iran, North Korea, Russia, or a Governor-designated country.

11. Pursuant to Texas Government Code Chapter 2274, Bidder certifies that, if it has 10 or more full-time employees, Bidder: (1) it does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association; and (2) will not discriminate during the term of the resulting contract against a firearm entity or firearm trade association.

12. Pursuant to Texas Government Code Chapter 2274, Bidder certifies that, if Bidder has 10 or more full-time employees, Bidder: (1) does not boycott energy companies; and (2) will not boycott energy companies during the term of the contract.

END

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STATE OF TEXAS
COUNTY OF TRAVIS

THIS AGREEMENT is made and entered into by and between the City of Austin, Texas, a municipal corporation, organized and existing under laws of State of Texas, acting through its City Manager or other duly authorized designee, hereinafter referred to as the "OWNER," and _____, of the City of _____, County of _____, and State of_____, hereinafter referred to as the "CONTRACTOR."

In consideration of the promises, performances, payments and agreements set forth herein CONTRACTOR hereby agrees to commence and complete the following Project:

_____
_____

and all Work in accordance with the Project Manual, Drawings and Addenda, which are incorporated herein by reference and made a part hereof and which have been prepared by _____ and approved by OWNER, and OWNER agrees to pay the CONTRACTOR the total amount of:

$	
(Figures)	**(Words)**

The CONTRACTOR hereby agrees to commence work on the date specified in the written "Notice to Proceed" to be issued by the OWNER and to <substantially> <finally> complete construction of the improvements, as required by the Project Manual, Drawings and Addenda for the Work within _____ (___) <Working> <Calendar> Days. <If a Substantial Completion date has been specified, the CONTRACTOR further agrees to reach Final Completion within <_____> (<___>) <Working> <Calendar> Days after Substantial Completion as required by the Project Manual, Drawings and Addenda for the work.> Waiver of any breach of this Contract shall not constitute waiver of any subsequent breach.

In consideration of the award and execution of this Contract, and in consideration of the waiver of its right to attorney's fees by the OWNER, the CONTRACTOR knowingly and intentionally waives its right to attorney's fees under Section 271.153 of the Texas Local Government Code in any administrative proceeding, alternative dispute resolution proceeding, or litigation arising out of or connected to this Contract.

OWNER agrees to pay CONTRACTOR from available funds for performance of the Contract in accordance with the Bid and the provisions of the Contract Documents, subject to additions and deductions, as provided therein.

The OWNER's payment obligations are payable only and solely from funds available for the purposes of this Agreement.

Although drafted by OWNER, this Agreement, in event of any disputes over its meaning or application, shall be interpreted fairly and reasonably, and neither more strongly for nor against either party.

This Agreement is executed to be effective upon the date of the last party to sign.

The undersigned, by their signature, represents that they are authorized to bind the Contractor to fully comply with the Contract. The Contractor, by signing below, acknowledge that they have read the entire contract and agree to be bound by the terms contained herein.

OWNER

By:_____
(Signature)

_____
Date

_____
Title of Signatory

CONTRACTOR

By:_____
(Signature)

_____
Date

_____
Printed Name of Signatory

_____
Title of Signatory, Authorized Rep

ATTEST (as applicable)

_____

***Corporate Secretary of Corporate Bidder or Corporate General Partner**

END

PERFORMANCE BOND
Section 00610

STATE OF TEXAS
COUNTY OF _____

Bond No. _____
C.I.P. ID No. _____

Project Name_____

Know All Men By These Presents: That _____ of the City of _____, County of _____, and State of _____, as Principal, and _____, a solvent company authorized under laws of the State of Texas to act as surety on bonds for principals, are held and firmly bound unto _____ (OWNER), in the penal sum of _____U.S. Dollars ($ _____U.S.) for payment whereof, well and truly to be made, said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, by these presents:

Conditions of this Bond are such that, whereas, Principal has entered into a certain written contract with OWNER, dated the _____ day of _____, _____, which Agreement is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

Now, therefore, the condition of this obligation is such, that if said Principal shall faithfully perform said Agreement and shall in all respects duly and faithfully observe and perform all and singular covenants, conditions and agreements in and by said contract agreed and covenanted by Principal to be observed and performed, and according to true intent and meaning of said Agreement hereto annexed, then this obligation shall be void; otherwise to remain in full force and effect. If OWNER notifies Principal and Surety the OWNER is considering declaring Principal in default, Surety agrees to meet with OWNER and Principal no later than fifteen days after receipt of such notice to discuss methods of performing the Work of the Contract.

Provided, however, that this bond is executed pursuant to provisions of Chapter 2253, Texas Government Code as amended and all liabilities on this bond shall be determined in accordance with provisions of said Article to same extent as if it were copied at length herein.

Surety, for value received, stipulates and agrees that no change in Contract Time or Contract Amount shall in anywise affect its obligation on this bond, and it does hereby waive notice of any such change in Contract Time or Contract Amount.

In witness whereof, said Principal and Surety have signed and sealed this instrument this _____day of _____, _____.

_____	_____
Principal	Surety
By_____	By_____
(Signature)	(Signature)
Title_____	Title_____
Address_____	Address_____
_____	_____

_____ _____

Telephone _____ Fax_____
E-Mail Address _____

Name and address of Resident Agent of Surety:
_____
_____

Note: Bond shall be issued by a solvent Surety company authorized to do business in Texas, and shall meet any other requirements established by law or by OWNER pursuant to applicable law. A copy of surety agent's "Power of Attorney" must be attached hereto.

END

PAYMENT BOND

Section 00620

STATE OF TEXAS
COUNTY OF _____

Bond No. _____
C.I.P. ID No. _____

Project Name: _____

Know All Men By These Presents: That _____ of the City of _____, County of _____, and State of _____ as Principal, and _____, a solvent company authorized under laws of the State of Texas to act as surety on bonds for principals, are held and firmly bound unto _____ (OWNER), and all Subcontractors, workers, laborers, mechanics and suppliers as their interests may appear, all of whom shall have right to sue upon this bond in the penal sum of _____ U.S. Dollars ($_____ U.S.) for payment whereof, well and truly to be made, said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, by these presents:

Conditions of this Bond are such that, whereas, Principal has entered into a certain written contract with OWNER, dated the _____ day of _____, _____, which Agreement is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

Now, therefore, condition of this obligation is such, that if the said Principal shall well and truly pay all Subcontractors, workers, laborers, mechanics, and suppliers, all monies to them owing by said Principals for subcontracts, work, labor, equipment, supplies and materials done and furnished for the construction of improvement of said Agreement, then this obligation shall be and become null and void; otherwise to remain in full force and effect.

Provided, however, that this bond is executed pursuant to provisions of Chapter 2253, Texas Government Code as amended and all liabilities on this bond shall be determined in accordance with provisions of said Article to same extent as if it were copied at length herein.

Surety, for value received, stipulates and agrees that no change in Contract Time or Contract Amount shall in anywise affect its obligation on this bond, and it does hereby waive notice of any such change in Contract Time or Contract Amount.

In witness whereof, said Principal and Surety have signed and sealed this instrument this _____day of _____, _____.

_____	_____
Principal	Surety
By_____	By_____
(Signature)	(Signature)
Title_____	Title_____

Address_____ Address_____
_____ _____
_____ _____

Telephone_____Fax_____

E-Mail Address _____

Name and address of Resident Agent of Surety:
_____
_____

Note: Bond shall be issued by a solvent Surety company authorized to do business in Texas and shall meet any other requirements established by law or by OWNER pursuant to applicable law. A copy of surety agent's "Power of Attorney" must be attached hereto.

END

NON-DISCRIMINATION AND NON-RETALIATION CERTIFICATE

Section 00630

City of Austin, Texas
Equal Employment/Fair Housing Office

To: City of Austin, Texas, ("OWNER")

Our firm conforms to the Code of the City of Austin Section 5-4-2 as reiterated below:

Chapter 5-4. Discrimination in Employment by City Contractors.

Sec. 4-2 Discriminatory Employment Practices Prohibited. (B) As an Equal Employment Opportunity (EEO) employer, the Contractor will conduct its personnel activities in accordance with established federal, state and local EEO laws and regulations and agrees:

(1) Not to engage in any discriminatory employment practice defined in this chapter.
(2) To take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without discrimination being practiced against them as defined in this chapter. Such affirmative action shall include, but not be limited to: all aspects of employment, including hiring, placement, upgrading, transfer, demotion, recruitment, recruitment advertising; selection for training and apprenticeship, rates of pay or other forms of compensation, and layoff or termination.
(3) To post in conspicuous places, available to employees and applicants for employment, notices to be provided by OWNER setting forth the provisions of this chapter.
(4) To state in all solicitations or advertisements for employees placed by or on behalf of Contractor, that all qualified applicants will receive consideration for employment without regard to race, creed, color, religion, national origin, sexual orientation, gender identity, disability, veteran status, sex or age.
(5) To obtain a written statement from any labor union or labor organization furnishing labor or service to Contractors in which said union or organization has agreed not to engage in any discriminatory employment practices as defined in this chapter and to take affirmative action to implement policies and provisions of this chapter.
(6) To cooperate fully with OWNER's Equal Employment/Fair Housing Office in connection with any investigation or conciliation effort of said Equal Employment/Fair Housing Office to ensure that the purpose of the provisions against discriminatory employment practices are being carried out.
(7) To require compliance with provisions of this chapter by all subcontractors having fifteen or more employees who hold any subcontract providing for expenditure of $2,000.00 or more in connection with any contract with OWNER subject to the terms of this chapter.

For the purposes of this Bid and any resulting Contract, Contractor adopts the provisions of the City's Minimum Standard Nondiscrimination and Non-Retaliation Policy as set forth below.

City of Austin
Minimum Standard Non-Discrimination and Non-Retaliation in Employment Policy

As an Equal Employment Opportunity (EEO) employer, the Contractor will conduct its personnel activities in accordance with established federal, state and local EEO laws and regulations.

The Contractor will not discriminate against any applicant or employee based on race, creed, color, national origin, sex, age, religion, veteran status, gender identity, disability, or sexual orientation. This policy covers all aspects of employment, including hiring, placement, upgrading, transfer, demotion, recruitment, recruitment advertising, selection for training and apprenticeship, rates of pay or other forms of compensation, and layoff or termination.

The Contractor agrees to prohibit retaliation, discharge or otherwise discrimination against any employee or applicant for employment who has inquired about, discussed or disclosed their compensation.

Further, employees who experience discrimination, sexual harassment, or another form of harassment should immediately report it to their supervisor. If this is not a suitable avenue for addressing their complaint, employees are advised to contact another member of management or their human resources representative. No employee shall be discriminated against, harassed, intimidated, nor suffer any reprisal as a result of reporting a violation of this policy. Furthermore, any employee, supervisor, or manager who becomes aware of any such discrimination or harassment should immediately report it to executive management or the human resources office to ensure that such conduct does not continue.

Contractor agrees that to the extent of any inconsistency, omission, or conflict with its current non-discrimination and non- retaliation employment policy, the Contractor has expressly adopted the provisions of the City's Minimum Non-Discrimination Policy contained in Section 5-4-2 of the City Code as set forth above and the City's Non-Retaliation Policy, as the Contractor's Non-Discrimination and Non-Retaliation Policy or as an amendment to such Policy and such provisions are intended to not only supplement the Contractor's policy, but will also supersede the Contractor's policy to the extent of any conflict.

UPON CONTRACT AWARD, THE CONTRACTOR SHALL PROVIDE A COPY TO THE CITY OF THE CONTRACTOR'S NON-DISCRIMINATION AND NON-RETALIAITON POLICY ON COMPANY LETTERHEAD, WHICH CONFORMS IN FORM, SCOPE, AND CONTENT TO THE CITY'S MINIMUM NON-DISCRIMINATION AND NON-RETALIATION POLICY, AS SET FORTH HEREIN, ***OR*** *THIS NON-DISCRIMINATION AND NON-RETALIATION POLICY, WHICH HAS BEEN ADOPTED BY THE CONTRACTOR FOR ALL PURPOSES (THE FORM OF WHICH HAS BEEN APPROVED BY THE CITY'S EQUAL EMPLOYMENT/FAIR HOUSING OFFICE), WILL BE CONSIDERED THE CONTRACTOR'S NON-DISCRIMINATION AND NON-RETALIATION POLICY WITHOUT THE REQUIREMENT OF A SEPARATE SUBMITTAL.*
(http://austintexas.gov/page/bid-docs).

Sanctions:
Our firm understands that non-compliance with Chapter 5-4 may result in sanctions, including termination of the contract and suspension or debarment from participation in future City contracts until deemed compliant with the requirements of Chapter 5-4.

Term:
The Contractor agrees that this Section 00630 Non-Discrimination and Non-Retaliation Certificate or the Contractor's separate conforming policy, which the Contractor has executed and filed with the Owner, will remain in force and effect for one year from the date of filing. The Contractor further agrees that, in consideration of the receipt of continued Contract payments, the Contractor's Non-Discrimination Policy will automatically renew from year-to-year for the term of the underlying Contract.

END

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TITLE VI ASSURANCES APPENDIX A
Section 00631

Solicitation Number: _____ (to be filled in by Contractor)

During the performance of this contract, the contractor, for itself, its assignees and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. Compliance with Regulations: The contractor (hereinafter includes consultants) will comply with the Acts and the Regulations relative to Nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation, the Federal Highway Administration, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

2. Nondiscrimination: The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate either directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 C.F.R. part 21.

3. Solicitations for Subcontracts, Including Procurements of Materials and Equipment: In all solicitations, either by competitive bidding or negotiation made by the contract for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Nondiscrimination on the grounds of race, color, or national origin.

4. Information and Reports: The contractor shall provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its book, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or the Federal Highway Administration to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information the contractor will so certify to the Recipient, or the Federal Highway Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

5. Sanctions for Noncompliance: In the event of the contractor's noncompliance with the Nondiscrimination provisions of this contract, the Recipient will impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to:

    (a) withholding of payments to the contractor under the contract until the contractor complies, and or
    (b) cancelling, terminating or suspending a contract, in whole or in part.

6. Incorporation of Provisions: The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the Recipient or the Federal Highway Administration may direct as a means of enforcing such provisions including sanctions for non-compliance: Provided, that if a

contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier because of such direction, the contractor may request the Recipient to enter into any litigation to protect the interests of the Recipient. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

(Source: DOT 1050.2A, Updated DOT Standard Title VI Assurances and Non-Discrimination Provisions 10/22/2013. Must be inserted into every contract/agreement regardless of funding sources.)

Contractor's full name and entity status:

_____

_____
(Name/Signature of Authorized Official)

_____
Title

_____
Date

END

TITLE VI ASSURANCES APPENDIX E
Section 00632

Solicitation Number: _____ (to be filled in by Contractor)

During the performance of this contract, the contractor (hereinafter includes consultants), for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees to comply with the following nondiscrimination statutes and authorities; including but not limited to:

Pertinent Nondiscrimination Authorities:

1. Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 C.F.R. Part 21.

2. The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C.§ 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);

3. Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et seq.), (prohibits discrimination on the basis of sex);

4. Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability); and 49 C.F.R. Part 27;

5. The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);

6. Airport and Airway Improvement Act of 1982, (49 U.S.C. § 4 71, Section 4 7123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);

7. The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, subrecipients and contractors, whether such programs or activities are Federally funded or not);

8. Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131-12189) as implemented by Department of Transportation regulations at 49 C.F.R. parts 37 and 38;

9. The Federal Aviation Administration's Nondiscrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);

10. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures nondiscrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;

11. Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP).

12. To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);

13. Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

(Source: DOT 1050.2A, Updated DOT Standard Title VI Assurances and Non-Discrimination Provisions 10/22/2013. Must be inserted into every contract/agreement regardless of funding sources.)

Contractor's full name and entity status:

_____

_____
(Name/Signature of Authorized Official)

_____
Title

_____
Date

END

CERTIFICATE OF INSURANCE

Section 00650

This Certificate shall be completed by a licensed insurance agent:

Name and Address of Agency:

_____
_____
_____
Phone: _____ / _____

Name and Address of Insured:

_____
_____
_____
Phone: _____/ _____

Prime or Sub-Contractor?: _____

Name of Prime Contractor, if different from Insured: _____

City of Austin Reference:
Project Name:
C.I.P. No.:
Project Location:

Managing Dept.:

Contract No.:
Project Mgr.:

Insurers Affording Coverages:

Insurer A: _____

Insurer B: _____

Insurer C: _____

Insurer D: _____

INSR LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFE-CTIVE DATE (MM/DD/YYYY)	POLICY EXPIR-ATION DATE (MM/DD/YYYY)	LIMITS OF LIABILITY	
	Commercial General Liability Policy As defined in the Policy, does the Policy provide:				Each Occurrence	$
					General Aggregate	$
	☐ Yes ☐ No -- Completed Operations/Products				Completed Operations /Products Aggregate	$
	☐ Yes ☐ No -- Contractual Liability				Personal & Advertising Injury	$
	☐ Yes ☐ No -- Explosion				Deductible or Self Insured Retention	$
	☐ Yes ☐ No -- Collapse					
	☐ Yes ☐ No -- Underground					
	☐ Yes ☐ No -- Contractors/ Subcontractors Work					
	☐ Yes ☐ No -- Aggregate Limits per Project Form CG 2503					
	☐ Yes ☐ No -- Additional Insured Form – CG 2010 and CG2037					
	☐ Yes ☐ No -- 30 Day Notice of Cancellation Form – CG 0205					
	☐ Yes ☐ No -- Waiver of Subrogation Form – CG 2404					
	Pollution/ Environmental Impairment Policy				Occurrence	$
					Aggregate	$

INSR LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFE-CTIVE DATE (MM/DD/YYYY)	POLICY EXPIR-ATION DATE (MM/DD/YYYY)	LIMITS OF LIABILITY	
	Auto Liability Policy As defined in the Policy, does the Policy provide:				CSL	$
					Bodily Injury (Per Accident)	$
	☐ Yes ☐ No -- Any Auto				Bodily Injury (Per Person)	$
	☐ Yes ☐ No -- All Owned Autos				Property Damage (Per Accident)	$
	☐ Yes ☐ No -- Non-Owned Autos					
	☐ Yes ☐ No -- Hired Autos					
	☐ Yes ☐ No -- Waiver of Subrogation – CA0444					
	☐ Yes ☐ No -- 30 Day Notice of Cancellation – CA0244					
	☐ Yes ☐ No -- Additional Insured – CA2048					
	☐ Yes ☐ No -- MCS 90					
	Excess Liability ☐ Umbrella Form ☐ Excess Liability Follow Form				Occurrence	$
					Aggregate	$
	Workers Compensation and Employers Liability As defined in the Policy, does the Policy provide:				☐ Statutory	
					Each Accident	$
	☐ Yes ☐ No -- Waiver of Subrogation – WC420304				Disease – Policy Limit	$
	☐ Yes ☐ No -- 30 Day Notice of Cancellation – WC420601				Disease – Each Employee	$
	Is a Builders Risk or Installation Insurance Policy provided? ☐ Yes ☐ No					$
	☐ Yes ☐ No -- Is the City shown as loss payee/mortgagee?					
	Professional Liability As defined in the Policy, does the Policy provide:				Each Claim	$
	☐ Yes ☐ No -- 30 Day Notice of Cancellation Retroactive Date: _____				Deductible or Self Insured Retention	$

This form is for informational purposes only and certifies that policies of insurance listed above have been issued to insured named above and are in force at this time. Not withstanding any requirements, term or condition of any contract or other document with respect to which this certificate may be issued or may pertain, insurance afforded by policies described herein is subject to all terms, exclusions and conditions of such policies.

CERTIFICATE HOLDER:

City of Austin
Capital Contracting Office
P.O. Box 1088
Austin, Texas 78767

DATE ISSUED: _____

_____
AUTHORIZED REPRESENTATIVE SIGNATURE
Licensed Insurance Agent

END

TEXAS SALES AND USE TAX EXEMPTION CERTIFICATE

Section 00670

City of Austin, Texas

P.O. Box 1088

Austin, Texas 78767

CONTRACTOR/PURCHASER:

Street Address:

City, State, ZIP Code:

Project:

Project Manager:

FDU No.:

CIP ID No.:

Description of items to be purchased or as described on the attached order or invoice:

_____

_____

The Contractor may purchase all labor, materials, supplies, and equipment to be incorporated in the City of Austin realty, including easements, or completely consumed at the Project jobsite and services required by or integral to the performance of the contract for the Project without paying sales or use tax in accordance with State Comptroller Rule 3.291.

Contractor/Purchaser claims this exemption for the following reason: This contract is to be performed for the City of Austin, a tax exempt entity under the Texas Tax Code.

I understand that I will be liable for payment of sales and use taxes which may become due for failure to comply with the provisions of the Tax Code. I also understand that it is a criminal offense to give an exemption certificate to the contractor for taxable items that I know, at the time of purchase, will be used in a manner other than that expressed in this certificate and depending on the amount of tax evaded, the offense may range from a Class B misdemeanor to a felony of the second degree.

City of Austin, Texas	Title
Mark Dombroski	Chief Financial Officer

CONTRACTOR/PURCHASER: _____

By: _____

Title: _____

Date: _____

NOTE: This certificate cannot be issued for the purchase, lease, or rental of a motor vehicle.

THIS CERTIFICATE DOES NOT REQUIRE A NUMBER TO BE VALID. Sales and Use Tax "Exemption Numbers" or "Tax Exempt" Numbers do not exist. This certificate should be furnished to the supplier. Do not send the completed certificate to the Comptroller of Public Accounts.

End

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NON-USE OF ASBESTOS AFFIDAVIT (CONTRACTOR PRIOR TO CONSTRUCTION)

Section 00680

STATE OF TEXAS
COUNTY OF TRAVIS

BEFORE ME, the undersigned authority, personally appeared the Affiant who, being by me first duly sworn, upon oath deposed and stated:

"My name is _____, hereinafter known as Affiant. "I am over the age of 18 years and I have never been convicted of a crime. I am the _____of_____ hereinafter known as CONTRACTOR.

"I am fully competent to make this affidavit. I have personal knowledge of the facts set forth below and they are all true and correct.

"WHEREAS CONTRACTOR has submitted a bid to the City of Austin as the Prime CONTRACTOR and anticipates being awarded a contract for the construction of _____located at_____, Austin, Texas, hereinafter known as Project, for the City of Austin, Texas, hereinafter known as OWNER, and "WHEREAS asbestos in a dust form is a recognized health hazard, and "WHEREAS the OWNER desires not to have any asbestos containing materials used or incorporated into the construction of the Project; "THEREFORE the CONTRACTOR affirms and understands the following:

1. The CONTRACTOR, any person, firm or organization representing or represented by the CONTRACTOR, or employed by the CONTRACTOR shall not cause or allow any material to be incorporated into the construction of the project, or allow any building material on the project site that is an asbestos containing material or any other material defined as containing asbestos by any laws, rules or regulations promulgated by the United States Government, the State of Texas or any governmental organization or agency operating under the authority of either of those entities.

2. Realizing that there might be some materials in which a satisfactory non-asbestos containing material could not be obtained, the Consultant has received prior approval from the OWNER before specifying any such asbestos containing material. Those approved materials are the only asbestos containing materials that are exempt from the above prohibition.

3. The CONTRACTOR certifies and affirms their understanding that if any asbestos containing materials not approved by the City of Austin for inclusion into the Project, are determined, as a result of any inspection and sample analysis performed by an individual(s) and/or firm(s) certified and/or licensed to perform such inspection by the United States Government and/or the State of Texas, to have been incorporated into the construction of the Project, or brought onto the site of the Project, the OWNER shall look to the CONTRACTOR for reimbursement of any and all costs incurred in the removal and/or other abatement of said asbestos containing materials.

4. CONTRACTOR further understands that OWNER shall also look to the CONTRACTOR for any and all damages to OWNER which result from the inability of the OWNER to use any portion or all of the Project due to the incorporation of asbestos containing materials that have not been approved by OWNER.

5. CONTRACTOR further understands that OWNER will pursue reimbursement of any said cost and compensation for any said damages from the CONTRACTOR by any and every means within OWNER's right and power.

Signature of Affiant: _____

STATE OF TEXAS
COUNTY OF TRAVIS

ON _____, 20___, personally appeared_____ and been duly sworn by me, subscribed to the foregoing affidavit and has stated that the facts stated therein are true and correct.

_____
Notary Public, State of Texas

_____
Printed Name of Notary

My Commission Expires:_____

END

NON-USE OF ASBESTOS AFFIDAVIT (CONTRACTOR AFTER CONSTRUCTION)

Section 00681

STATE OF TEXAS
COUNTY OF TRAVIS

BEFORE ME, the undersigned authority, personally appeared the Affiant who, being by me first duly sworn, upon oath deposed and stated:

"My name is _____, hereinafter known as Affiant. "I am over the age of 18 years and I have never been convicted of a crime. I am the _____of_____ hereinafter known as CONTRACTOR.

"I am fully competent to make this affidavit. I have personal knowledge of the facts set forth below and they are all true and correct.

"WHEREAS CONTRACTOR was awarded a Contract for, and was the Prime CONTRACTOR for the construction of _____ located at _____, Austin, Texas, hereinafter known as Project, for the City of Austin, Texas, hereinafter known as OWNER, and "WHEREAS asbestos in a dust form is a recognized health hazard, and "WHEREAS the OWNER desires not to have any asbestos containing materials used or incorporated into the construction of the Project; "THEREFORE the CONTRACTOR affirms and understands the following:

1. The CONTRACTOR, any person, firm or organization representing or represented by the CONTRACTOR, or employed by the CONTRACTOR has not caused or allowed any material to be incorporated into the construction of the project, or allowed any building material on the project site that is an asbestos containing material or any other material defined as containing asbestos by any laws, rules or regulation promulgated by the United States Government, the State of Texas or any governmental organization or agency operating under the authority of either of those entities.

2. Realizing that there were some materials in which a satisfactory non-asbestos containing material could not be obtained, the Consultant received prior approval from the OWNER before specifying any such asbestos containing material. Those approved materials were the only asbestos containing materials incorporated into the construction of the Project and are listed below, with their locations:

_____

_____

_____

3. The CONTRACTOR certifies and affirms their understanding that if any asbestos containing materials not approved by the City of Austin for inclusion into the Project, are determined, as a result of any inspection and sample analysis performed by an individual(s) and/or firm(s) certified and/or licensed to perform such inspection by the United States Government and/or the State of Texas, to have been incorporated into the construction of the Project, or brought onto the site of the Project, the OWNER shall look to the CONTRACTOR for reimbursement of any and all costs incurred in the removal and/or other abatement of said asbestos containing materials.

4. CONTRACTOR further understands that OWNER shall also look to the CONTRACTOR for any and all damages to OWNER which result from the inability of the OWNER to use any portion or all of the Project due to the incorporation of asbestos containing materials that have not been approved by OWNER.

5. CONTRACTOR further understands that OWNER will pursue reimbursement of any said cost and compensation for any said damages from the CONTRACTOR by any and every means within OWNER's right and power.

Signature of Affiant:_____

STATE OF TEXAS
COUNTY OF TRAVIS

On _____, 20___, personally appeared_____ and been duly sworn by me, subscribed to the foregoing affidavit and has stated that the facts stated therein are true and correct.

_____
Notary Public, State of Texas

_____
Printed Name of Notary

My Commission Expires: _____

END

Bidding Requirements, Contract Forms and Conditions of the Contract

GENERAL CONDITIONS OF THE CONTRACT

Section 00700

General Conditions Table of Contents

ARTICLE 1 – DEFINITIONS

Whenever used in these General Conditions or in the other Contract Documents the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

1.1 Addendum - Written instruments issued by the Contract Awarding Authority which clarify, correct or change the bidding requirements or the Contract Documents prior to the Due Date. "Addenda" is the plural form of Addendum.

1.2 Agreement - Prescribed form, Section 00500.

1.3 Alternative Dispute Resolution - The process by which a disputed Claim may be settled if the OWNER and the CONTRACTOR cannot reach an agreement between themselves, as an alternative to litigation.

1.4 Bid - A complete, properly signed response to an Invitation for Bid that, if accepted, would bind the Bidder to perform the resultant Contract.

1.5 Bidder - A person, firm, or entity that submits a Bid in response to a Solicitation. Any Bidder may be represented by an agent after submitting evidence demonstrating the agent's authority. The agent cannot certify as to his own agency status.

1.6 Bid Documents - The advertisement or Invitation for Bids, instructions to Bidders, the Bid form, the Contract Documents and Addenda.

1.7 Calendar Day - Any day of the week; no days being excepted. Work on Saturdays, Sundays, and/or Legal Holidays shall be coordinated with OWNER.

1.8 Change Directive - A written directive to CONTRACTOR, signed by OWNER, ordering a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Amount or Contract Time, or both. A Change Directive may be used in the absence of total agreement on the terms of a Change Order. A Change Directive does not change the Contract Amount or Contract Time, but is evidence that the parties expect that the change directed or documented by a Change Directive will be incorporated in a subsequently issued Change Order.

1.9 Change Orders - Written agreements entered into between CONTRACTOR and OWNER authorizing an addition, deletion, or revision to the Contract, issued on or after the Execution Date of the Agreement.

1.10 Claim - A written demand seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract.

1.11 Contract - The binding legal agreement between the OWNER and the CONTRACTOR. The Contract represents the entire and integrated agreement between OWNER and CONTRACTOR for performance of the Work, as evidenced by the Contract Documents.

1.12 Contract Amount - The moneys payable by OWNER to CONTRACTOR for completion of the Work in accordance with the Contract Documents.

1.13 Contract Awarding Authority - A City department authorized to enter into Contracts on behalf of the City.

1.14 Contract Documents - Project Manual, Drawings, Addenda and Change Orders.

1.15 Contract Time - The number of days allowed for completion of the Work as defined by the Contract. When any period is referred to in days, it will be computed to exclude the first and include the last day of such period. A day of twenty-four hours measured from midnight to the next midnight will constitute a day.

1.16 CONTRACTOR - The individual, firm, corporation, or other business entity with whom OWNER has entered into the Contract for performance of the Work.

1.17 Critical Path - The longest series of tasks that runs consecutively from the beginning to the end of the project, as determined by duration and workflow sequence. This longest path sets the managerial standard for how quickly a project can be completed, given appropriate resources.

1.18 Drawings - Those portions of the Contract Documents which are graphic representations of the scope, extent and character of the Work to be furnished and performed by CONTRACTOR and which have been approved by OWNER. Drawings may include plans, elevations, sections, details, schedules and diagrams. Shop Drawings are not Drawings as so defined.

1.19 Due Date - The date and time specified for receipt of Bids.

1.20 Engineer/Architect (E/A) - The OWNER's design professional identified as such in the Contract. The titles of "Architect/Engineer," "Architect" and "Engineer" used in the Contract Documents shall read the same as Engineer/Architect (E/A). Nothing contained in the Contract Documents shall create any contractual or agency relationship between E/A and CONTRACTOR.

1.21 Equal - The terms "equal" or "approved equal" shall have the same meaning.

1.22 Execution Date - Date of last signature of the parties to the Agreement.

1.23 Field Order - A written order issued by Owner's Representative which orders minor changes in the Work and which does not involve a change in the Contract Amount or the Contract Time.

1.24 Final Completion - The point in time when OWNER determines that all Work has been completed and final payment to CONTRACTOR will be made in accordance with the Contract Documents.

1.25 Force Account - a basis of payment for the direct performance of Work with payment based on the actual cost of the labor, equipment and materials furnished and consideration for overhead and profit as set forth in Section 11.5.

1.26 Inspector - The authorized representative of any regulatory agency that has jurisdiction over any portion of the Work.

1.27 Invitation for Bid (IFB) - a Solicitation requesting pricing for a specified Good or Service which has been advertised for Bid in a newspaper and/or the Internet.

1.28 Legal Holidays

1.28.1 The following are recognized by the OWNER:

Holiday	Date Observed
New Year's Day	January 1
Martin Luther King, Jr.'s Birthday	Third Monday in January
President's Day	Third Monday in February
Memorial Day	Last Monday in May
Juneteenth	June 19
Independence Day	July 4
Labor Day	First Monday in September
Veteran's Day	November 11
Thanksgiving Day	Fourth Thursday in November
Friday after Thanksgiving	Friday after Thanksgiving

Christmas Eve	December 24
Christmas Day	December 25

1.28.2 If a Legal Holiday falls on Saturday, it will be observed on the preceding Friday. If a Legal Holiday falls on Sunday, it will be observed on the following Monday.

1.28.3 Christmas Eve is observed only if it falls on a Monday through Thursday. If Christmas Eve falls on a Friday, that day is observed as the Christmas Day holiday.

1.29 Milestones - A significant event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

1.30 Notice to Proceed - A Written Notice given by OWNER to CONTRACTOR fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform CONTRACTOR's obligations under the Contract Documents.

1.31 OWNER - City of Austin, Texas, a municipal corporation, home rule city and political subdivision organized and existing under the laws of the State of Texas, acting through the City Manager or his/her designee, officers, agents or employees to administer design and construction of the Project.

1.32 Owner's Representative - The designated representative of the OWNER. The Owner's Representative will be identified at the pre-construction conference.

1.33 Partial Occupancy or Use - Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work, provided OWNER and CONTRACTOR have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, utilities, corrective work, insurance and warranties.

1.34 Project - The subject of the Work and its intended result.

1.35 Project Manual - That portion of the Contract Documents which may include the following: introductory information; bidding requirements, Contract forms and General and Supplemental General Conditions; General Requirements; Specifications; Drawings; MBE/WBE or DBE Procurement Program Package; Project Safety Manual; and Addenda.

1.36 Resident Project Representative - The authorized representative of E/A who may be assigned to the site or any part thereof.

1.37 Shop Drawings - All drawings, diagrams, illustrations, schedules and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR as required by the Contract Documents.

1.38 Specifications - Those portions of the Contract Documents consisting of written technical descriptions as applied to the Work, which set forth to CONTRACTOR, in detail, the requirements which must be met by all materials, equipment, construction systems, standards, workmanship, equipment and services in order to render a completed and useful project.

1.39 Solicitation - Solicitation means, as applicable, an Invitation for Bid or a Request for Proposal.

1.40 Substantial Completion - 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 OWNER can occupy or utilize the Work for its intended use, as evidenced by a Certificate of Substantial Completion approved by OWNER.

1.41 Subcontractor - An individual, firm, corporation, or other business entity having a direct contract with CONTRACTOR for the performance of a portion of the Work under the Contract.

1.42 Sub-Subcontractor - A person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the work.

1.43 Superintendent - The representative of CONTRACTOR authorized in writing to receive and fulfill instructions from the Owner's Representative, and who shall supervise and direct construction of the Work.

1.44 Supplemental General Conditions - The part of the Contract Documents which amends or supplements the General Conditions. All General Conditions which are not so amended or supplemented remain in full force and effect.

1.45 Supplier - An individual or entity having a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor.

1.46 Time Extension Request - An approved request for time extension on a form acceptable to OWNER.

1.47 Work - The entire completed construction, or the various separately identifiable parts thereof, required to be furnished under the Contract Documents.

1.48 Working Day - Any day of the week, not including Saturdays, Sundays, or Legal Holidays in which conditions under the CONTRACTOR's control will permit work for a continuous period of not less than seven (7) hours between 7:00 a.m. and 6:00 p.m. If other contract documents reduce the continuous period available for work to less than seven (7) hours, those reduced hours shall be considered a Working Day. Upon agreement with Owner's Representative, work on Saturdays, Sundays, and/or Legal Holidays may be allowed and will be considered a Working Day.

1.49 Working Hours

1.49.1 Working Day Contract: All Work shall be done between 7:00 a.m. and 6:00 p.m. unless otherwise authorized by Owner's Representative. However, emergency work may be done without prior permission as indicated in paragraph 6.11.5. If night Work is authorized and conditions under CONTRACTOR's control will permit Work for a continuous period of not less than seven (7) hours between 12:00 a.m. and 11:59 p.m. it will be considered a Working Day. Night Work may be revoked at any time by OWNER if CONTRACTOR fails to maintain adequate equipment and supervision for the prosecution and control of the night Work.

1.49.2 Calendar Day Contract: All Work shall be done between 7:00 a.m. and 6:00 p.m. unless authorized by Owner’s Representative. However, emergency work may be done without prior permission as indicated in paragraph 6.11.5. Night Work may be revoked at any time by OWNER if CONTRACTOR fails to maintain adequate equipment and supervision for the prosecution and control of the night Work.

1.50 Written Notice - Written communication between OWNER and CONTRACTOR. Written Notice shall be deemed to have been duly served if delivered in person to Owner's Representative or CONTRACTOR's duly authorized representative, or if delivered at or sent by registered or certified mail to the attention of Owner's Representative or CONTRACTOR's duly authorized representative at the last business address known to the party giving notice.

ARTICLE 2 - PRELIMINARY MATTERS

2.1 Delivery of Agreement, Bonds, Insurance, etc.: Within five (5) Working Days after written notification of award of Contract, CONTRACTOR shall deliver to OWNER signed Agreement, Bond(s), Insurance Certificate(s) and other documentation required for execution of Contract.

2.2 Copies of Documents: OWNER shall furnish to CONTRACTOR (1) copy of the executed Project Manual, one (1) set of Drawings and one (1) copy of the Contract Documents in .pdf format. Additional copies will be furnished, upon request, at the cost specified in the Supplemental General Conditions."

2.3 Commencement of Contract Times; Notice to Proceed: The Contract Time(s) will begin to run on the day indicated in the Notice to Proceed. Notice to Proceed will be given at any time within sixty (60) calendar days after the Execution Date of the Agreement, unless extended by written agreement of the parties.

2.4 Before Starting Construction:

2.4.1 No Work shall be done at the site prior to the preconstruction conference without OWNER's approval. Before undertaking each part of the Work, CONTRACTOR shall carefully study the Contract Documents to check and verify pertinent figures shown thereon compare accurately to all applicable field measurements. CONTRACTOR shall promptly report in writing to Owner's Representative any conflict, error, ambiguity or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from Owner's Representative before proceeding with any Work affected thereby. CONTRACTOR shall be liable to OWNER for failure to report any conflict, error, ambiguity or discrepancy in the Contract Documents of which CONTRACTOR knew or reasonably should have known.

2.4.2 It is mutually agreed between CONTRACTOR and OWNER that successful completion of the Work within the Contract completion date is of primary importance. Therefore, the CONTRACTOR hereby agrees to submit to the Owner's Representative for review and approval, or acceptance, as appropriate, all information requested within this section, including a Baseline Schedule, no later than five working days prior to the preconstruction conference. The Owner's Representative will schedule the preconstruction conference upon the timely submittal of the required documents, unless time is extended by written mutual agreement. CONTRACTOR will submit the following:

.1 A proposed Baseline Schedule developed using Microsoft Project software, unless otherwise approved by Owner's Representative ("Baseline Schedule") to confirm that all Work will be completed within the Contract time. The Baseline Schedule must (i) indicate the times (number of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents, (ii) identify the Critical Path for completing the Work, (iii) identify when all Subcontractors will be utilized, and (iv) take into consideration any limitations on Working Hours, including baseline Rain Days on Calendar Day Contracts, and (v) be prepared accordance with Section 01310, Schedules and Reports, if applicable; otherwise in accordance with Section 01300, Submittals. This Baseline Schedule, a copy of which shall be made available at the job site(s), must contain sufficient detail to indicate that the CONTRACTOR has properly identified required Work elements and tasks, has provided for a sufficient and proper workforce and integration of Subcontractors, has provided sufficient

resources and has considered the proper sequencing of the Work required to result in a successful Project that can be completed within the Contract time;

.2 An organizational chart showing the principals and management personnel who will be involved with the Work, including each one's responsibilities for the Work;

.3 To the extent not set forth in the Section 00400 Statement of Contractor's Experience, a complete listing of the CONTRACTOR's employees proposed for the Work. List each one by name and job title, and show length of employment with CONTRACTOR;

.4 To the extent not set forth in the Section 00410 Statement of Bidder's Safety Experience, a discussion and confirmation of the CONTRACTOR's commitment to safety by providing a copy of its employee's safety handbook and the safety records for the past three years of CONTRACTOR's proposed project manager and Superintendent;

.5 A preliminary schedule of Shop Drawing and sample submittals;

.6 A preliminary schedule of values for all of the Work, subdivided into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will be deemed to include an appropriate amount of overhead and profit applicable to each item of Work;

.7 To the extent not set forth in the Section 00400 Statement of Contractor's Experience, a letter designating CONTRACTOR's Superintendent and project manager, and a confirmation of past project experience for the CONTRACTOR's Superintendent and project manager specifically intended for the Work;

.8 A letter from CONTRACTOR and Subcontractor(s) listing salaried specialists. A salaried specialist is anyone except an hourly worker whose wage rate is governed by Section 00830 of this agreement;

.9 A letter designating the project's Safety Representative along with a copy of their Department of Labor-issued OSHA card proving completion of the OSHA 30-hour Construction Safety and Health training class in the OSHA Outreach Training Program;

.10 If applicable, an excavation safety system plan;

.11 If applicable, a plan illustrating proposed locations of temporary facilities;

.12 A completed Non-Use of Asbestos Affidavit (Prior to Construction);

.13 A letter designating the Texas Registered Professional Land Surveyor for layout of the Work, if the Work requires the services of a surveyor; and

.14 Copies of the Department of Labor-issued OSHA cards proving completion of the OSHA 10-hour Construction Safety and Health training class in the OSHA Outreach Training Program for each worker (defined as a person covered by a prevailing wage determination) that will initially be on site. Note that workers must possess other OSHA-required training as the work dictates in accordance with the OSHA Act; and specifically, the contractor must meet the required provisions in 509S Excavation Safety Systems required prior to commencing excavation;

.15 A certificate of worker's compensation insurance coverage for all persons providing services on the Project (refer to 5.2.1.3 in Section 00700 for definition of persons providing services on the Project);

.16 A Construction Equipment Emissions Reduction Plan.

2.4.3 Neither the acceptance nor the approval of any of the submittals required in paragraph 2.4.2, above, will constitute the adoption, affirmation, or direction of the CONTRACTOR'S means and methods.

2.5 Preconstruction Conference: Prior to commencement of Work at the site, CONTRACTOR must attend a preconstruction conference with Owner's Representative and others, as set forth in Division 1. Additionally, prior to commencement of work, the CONTRACTOR shall host a preconstruction conference for the Subcontractors identified on the originally approved compliance plan, Owner's Representative and others, as set forth in Division 1. The CONTRACTOR shall notify all Subcontractors five (5) working days prior to the preconstruction conference. If the CONTRACTOR has included Subcontractors in the initial preconstruction conference, the additional Subcontractor preconstruction conference will not be required.

2.6 Initially Acceptable Schedules: Unless otherwise provided in the Contract Documents, CONTRACTOR shall obtain approval of Owner's Representative on the Baseline Schedule submitted in accordance with paragraph 2.4.2.1 and Division 1 before the first progress payment will be made to CONTRACTOR. The Baseline Schedule must provide for an orderly progression of the designated portion of the Work to completion within any specified Milestones and Contract Times. Acceptance of the schedule by Owner's Representative will neither impose on Owner's Representative responsibility or liability for the sequencing, scheduling or progress of the Work nor interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility for such Work. CONTRACTOR's schedule of Shop Drawings and sample submissions must provide an acceptable basis for reviewing and processing the required submittals. CONTRACTOR's schedule of values must conform to the requirements set forth in Division 1.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.1 Intent:

3.1.1 The intent of the Contract Documents is to include all information necessary for the proper execution and timely completion of the Work by CONTRACTOR. The CONTRACTOR will execute the Work described in and reasonably inferable from the Contract Documents as necessary to produce the results indicated by the Contract Documents. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all. In cases of disagreement, the following order of precedence shall generally govern (top item receiving priority of interpretation):

Signed Agreement
Addendum to the Contract Documents, including approved changes
Supplemental General Conditions
General Conditions
Other Bidding Requirements and Contract Forms
Special Provisions to the Standard Technical Specifications
Special Specifications
Standard Technical Specifications

Drawings (figured dimensions shall govern over scaled dimensions)
Project Safety Manual (if applicable),

with the understanding that a common sense approach will be utilized as necessary so that the Contract Documents produce the intended response.

3.1.2 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.

3.2 Reporting and Resolving Discrepancies: If, during the performance of the Work, CONTRACTOR discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provisions of any such law or regulation applicable to the performance of the Work or of any such standard, specification, manual or code or instructions of any Supplier, CONTRACTOR shall report it to Owner's Representative in writing at once, and CONTRACTOR shall not proceed with the Work affected thereby until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.3.1 or 3.3.2. CONTRACTOR shall be liable to OWNER for failure to report any such conflict, error, ambiguity or discrepancy of which CONTRACTOR knew or reasonably should have known.

3.3 Modifying and Supplementing Contract Documents:

3.3.1 The Contract Documents may be modified to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions by change order or contract amendment.

3.3.2 In addition, the requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, in one or more of the following ways:

.1 Field Order.

.2 Review of a Shop Drawing or sample.

.3 Written interpretation or clarification.

3.4 Reuse of Documents Prohibited: CONTRACTOR and any Subcontractor or Supplier or other person or organization performing or furnishing any of the Work under a direct or indirect contract with OWNER: (i) shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications or other documents (or copies of any thereof) prepared by or bearing the seal of E/A or E/A's consultant, and (ii) shall not reuse any of such Drawings, Specifications, other documents or copies on extensions of the Project or any other project without written consent of OWNER and E/A.

3.5 In the event of the breach by the OWNER or CONTRACTOR of any of its obligations under the Contract, so as to support a claim by the other party, the provisions of this Contract will be equitably construed to allow the resolution of such a claim and all of the other provisions of this Contract shall continue in full force and effect as to the rights, responsibilities, and remedies of the OWNER and CONTRACTOR.

ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

4.1 Availability of Lands: The OWNER will provide access to all land and interests in land required for the Work and will notify CONTRACTOR of any restrictions in such access. CONTRACTOR may make a claim if OWNER fails to provide timely access to the Work.

CONTRACTOR must obtain any additional temporary construction facilities, stockpiling or storage sites not otherwise provided.

4.2 Subsurface and Physical Conditions:

4.2.1 CONTRACTOR specifically represents that it has carefully examined the plans, the geotechnical report, if any, and the site of the proposed Work and is thoroughly familiar with all of the conditions surrounding construction of the Project, having had the opportunity to conduct any and all additional inquiry, tests and investigation that he/she deems necessary and proper. CONTRACTOR acknowledges the receipt of the geotechnical report, if any, and agrees that the report, while it is an accurate record of the geotechnical conditions at the boring locations, is not a guarantee of specific site conditions which may vary between boring locations.

4.2.2 CONTRACTOR must notify OWNER in writing as soon as reasonably possible, but no later than three (3) calendar days, if unforeseen conditions are encountered at the site which are (i) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (ii) unknown physical conditions of an unusual nature, that differ materially from those normally encountered in the type of work being performed under this Contract. CONTRACTOR may not disturb the conditions until OWNER conducts an investigation. Owner's Representative and E/A will promptly investigate such conditions with E/A. If it is determined that such conditions 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, Owner's Representative will recommend an equitable adjustment in the Contract Amount or Contract Time, or both. If it is determined that such conditions are not materially different from those indicated in the Contract Documents, Owner's Representative will notify CONTRACTOR in writing of such findings and the Contract will not be adjusted. CONTRACTOR may dispute such a determination in accordance with Article 16.

4.2.3 Notwithstanding any other provision of this Contract, CONTRACTOR is solely responsible for the location and protection of any and all public utility lines and utility customer service lines in the Work area. "Public utility lines" means the utility distribution and supply system, and "utility customer service lines" means the utility lines connecting customers to the utility distribution and collection system. Generally, existing utility customer service line connections are not shown on the Drawings. CONTRACTOR shall notify "One Call" and exercise due care to locate, mark, uncover and otherwise protect all such lines in the construction zone and any of CONTRACTOR's work or storage areas. CONTRACTOR's responsibility for the location and protection of utilities is primary and nondelegable. **CONTRACTOR shall indemnify or reimburse such expenses or costs (including fines that may be levied against OWNER) that may result from unauthorized or accidental damage to all public lines and utility customer service lines in the work area. OWNER reserves the right to repair any damage CONTRACTOR causes to such utilities at CONTRACTOR's expense. If a public line and/or customer service line is damaged by CONTRACTOR, CONTRACTOR shall give verbal notice within one (1) hour and written notice within twenty-four (24) hours to the Owner's Representative.**

4.2.4 CONTRACTOR shall take reasonable precaution to avoid disturbing primitive records and antiquities of archaeological, paleontological or historical significance. No objects of this nature shall be disturbed without written permission of OWNER and Texas Historical Commission. When such objects are uncovered unexpectedly, CONTRACTOR shall stop all Work in close proximity and notify Owner's Representative and Texas Historical Commission of their presence and shall not disturb them until written permission and permit to do so is granted. All primitive rights and antiquities uncovered on OWNER's property shall remain property of State of Texas, Texas Historical Commission conforming to Texas Natural Resources Code. If it is determined by OWNER, in consultation with Texas Historical Commission, that exploration or excavation of primitive records or antiquities on Project site is necessary to avoid loss, CONTRACTOR shall cooperate in salvage work attendant to preservation. If the Work stoppage or salvage work causes an increase in CONTRACTOR's cost of, or time required for, performance of the Work, the Contract Amount and/or Contract Time will be equitably adjusted.

4.3 Reference Points: Unless otherwise specified, all control lines and bench marks suitable for use in layout will be furnished by OWNER. Lay out of the Work shall be performed in accordance with Division 1. Controls, bench marks and property boundary markers shall be carefully preserved by CONTRACTOR by use of flags, staffs or other visible devices and in case of destruction or removal by CONTRACTOR or its employees, such controls and bench marks shall be replaced by a Registered Professional Land Surveyor at CONTRACTOR's expense. City of Austin survey monuments damaged by CONTRACTOR will be reestablished by OWNER at CONTRACTOR's expense.

4.4 Hazardous Materials:

4.4.1 To the extent provided by applicable law, OWNER shall be responsible for any hazardous material uncovered or revealed at the site which was not shown, indicated or identified in the Contract Documents to be within the scope of the Work and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the site. CONTRACTOR shall immediately notify Owner's Representative of any suspected hazardous materials encountered before or during performance of the Work and shall take all necessary precautions to avoid further disturbance of the materials.

4.4.2 CONTRACTOR shall be responsible for any hazardous materials brought to the site by CONTRACTOR, Subcontractor, Suppliers or anyone else for whom CONTRACTOR is responsible.

4.4.3 No asbestos-containing materials shall be incorporated into the Work or brought on Project site without prior approval of OWNER. The CONTRACTOR shall not knowingly use, specify, request or approve for use any asbestos containing materials or lead-based paint without the OWNER'S written approval. When a specific product is specified, the CONTRACTOR shall endeavor to verify that the product does not include asbestos containing material.

4.4.4 Refer to Division 1 for hazardous material definitions and procedures.

.1 Unless otherwise expressly provided in the Contract Documents to be part of the Work, CONTRACTOR is not responsible for any unexpected Hazardous Materials encountered at the site. Upon encountering any Hazardous Conditions, CONTRACTOR must stop Work immediately in the affected area and duly notify OWNER and, if required by applicable law or regulations, all government or quasi-government entities with jurisdiction over the Project or site.

.2 Upon receiving notice of the presence of suspected Hazardous Materials, OWNER shall take the necessary measures required to ensure that the Hazardous Materials are remediated or rendered harmless. Such necessary measures shall include OWNER retaining qualified independent experts to (i) ascertain whether Hazardous Materials have actually been encountered, and, if they have been encountered, (ii) prescribe the remedial measures that OWNER must take either to remove the Hazardous Materials or render the Hazardous Materials harmless.

.3 CONTRACTOR shall be obligated to resume Work at the affected area of the Project only after OWNER's Representative provides written certification that (i) the Hazardous Materials have been removed or rendered harmless and (ii) all necessary approvals have been obtained from all government and quasi-government entities having jurisdiction over the Project or site. The CONTRACTOR shall be responsible for continuing the Work in the unaffected portion of the Project and site.

.4 CONTRACTOR will be entitled, in accordance with these General Conditions, to an adjustment in its Contract Amount and/or Contract Time(s) to the extent CONTRACTOR's cost and/or time of performance have been adversely impacted by the presence of Hazardous Materials.

.5 Notwithstanding the preceding provisions of this Section 4.1, OWNER is not responsible for Hazardous Materials introduced to the Site by CONTRACTOR, Subcontractors or anyone for whose acts they may be liable. **CONTRACTOR shall indemnify, defend and hold harmless OWNER and OWNER's officers, directors, employees and agents from and against all claims, losses, damages, liabilities and expenses, including attorneys' fees and expenses, arising out of or resulting from those hazardous materials introduced to the site by CONTRACTOR, Subcontractors or anyone for whose acts they may be liable.**

4.4.5 CONTRACTOR shall be responsible for use, storage and remediation of any hazardous materials brought to the Site by CONTRACTOR, Subcontractors, Suppliers or anyone else for whom CONTRACTOR is responsible.

ARTICLE 5 - BONDS AND INSURANCE

5.1 Surety and Insurance Companies: All bonds and insurance required by the Contract Documents shall be obtained from solvent surety or insurance companies that are duly licensed by the State of Texas and authorized to issue bonds or insurance policies for the limits and coverages required by the Contract Documents. The bonds shall be in a form acceptable to OWNER and shall be issued by a surety which complies with the requirements of Texas Insurance Code, Title 12, Chapter 3503. The surety must obtain reinsurance for any portion of the risk that exceeds 10% of the surety's capital and surplus. For bonds exceeding $100,000, the surety must also hold a certificate of authority from the U.S. Secretary of the Treasury or have obtained reinsurance for any liability in excess of $1,000,000 from a reinsurer that is authorized as a reinsurer in Texas or holds a certificate of authority from the U.S. Secretary of the Treasury. In the event that the proposed surety for a contract award in excess of $100,000 does not hold a certificate of authority from the

U.S. Secretary of the Treasury and/or its proposed reinsurer does not hold a certificate of authority from the U.S. Secretary of the Treasury, the OWNER may require additional financial solvency information from the Bidder/Contractor and the proposed surety company and/or reinsurer as part of the 00400 Statement of Bidders Experience and determination of bidder responsibility in the award of the Contract.

5.2 Workers' Compensation Insurance Coverage:

5.2.1 Definitions:

.1 Certificate of coverage ("certificate") - A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement (DWC-81, DCW-82, DCW-83, or DCW84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on the Project, for the duration of the Project.

.2 Duration of the Project - includes the time from the beginning of the Work on the Project until the CONTRACTOR's/ person's Work on the Project has been completed and accepted by OWNER.

.3 Persons providing services on the Project ("subcontractor" in Texas Labor Code, Section 406.096) - includes all persons or entities performing all or part of the services the CONTRACTOR has undertaken to perform on the Project, regardless of whether that person contracted directly with the CONTRACTOR and regardless of whether that person has employees. This includes, without limitation, independent contractors, Subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the Project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the Project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

5.2.2 CONTRACTOR shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the CONTRACTOR providing services on the Project, for the duration of the Project.

5.2.3 CONTRACTOR must provide a certificate of coverage to OWNER prior to being awarded the Contract.

5.2.4 If the coverage period shown on the CONTRACTOR's current certificate of coverage ends during the duration of the Project, the CONTRACTOR must, prior to the end of the coverage period, file a new certificate of coverage with OWNER showing that coverage has been extended.

5.2.5 CONTRACTOR shall obtain from each person providing services on the Project, and provide to OWNER:

.1 A certificate of coverage, prior to that person beginning Work on the Project, so OWNER will have on file certificates of coverage showing coverage for all persons providing services on the Project; and

.2 No later than seven (7) days after receipt by CONTRACTOR, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project.

5.2.6 CONTRACTOR shall retain all required certificates of coverage for the duration of the Project and for one (1) year thereafter.

5.2.7 CONTRACTOR shall notify OWNER in writing by certified mail or personal delivery, within ten (10) days after CONTRACTOR knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project.

5.2.8 CONTRACTOR shall post on each Project site a notice, in the text, form and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the Project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

5.2.9 CONTRACTOR shall contractually require each person with whom it contracts to provide services on a Project, to:

.1 Provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all of its employees providing services on the Project, for the duration of the Project;

.2 Provide to CONTRACTOR, prior to that person beginning Work on the Project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the Project, for the duration of the Project;

.3 Provide CONTRACTOR, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;

.4 Obtain from each other person with whom it contracts, and provide to CONTRACTOR: a) a certificate of coverage, prior to the other person beginning Work on the Project; and b) a new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;

.5 Retain all required certificates of coverage on file for the duration of the Project and for one (1) year thereafter;

.6 Notify OWNER in writing by certified mail or personal delivery, within ten (10) days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project; and

.7 Contractually require each person with whom it contracts, to perform as required by paragraphs 5.2.9.1 - 5.2.9.7, with the certificates of coverage to be provided to the person for whom they are providing services.

5.2.10 By signing this Contract or providing or causing to be provided a certificate of coverage, CONTRACTOR is representing to OWNER that all employees of the CONTRACTOR who will provide services on the Project will be covered by workers' compensation coverage for the duration of the Project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the Texas Worker’s Compensation Commission's Division of Self- Insurance Regulation. Providing false or misleading information

may subject CONTRACTOR to administrative penalties, criminal penalties, civil penalties, or other civil actions.

5.2.11 CONTRACTOR's failure to comply with any of these provisions is a breach of Contract by CONTRACTOR which entitles OWNER to declare the Contract void if CONTRACTOR does not remedy the breach within ten (10) days after receipt of notice of breach from OWNER.

5.3 Other Bond and Insurance Requirements: For additional insurance requirements, refer to the Supplemental General Conditions.

5.4 Bonds:

5.4.1 General.

.1 Bonds, when required, shall be executed on forms furnished by or acceptable to OWNER. All bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

.2 If the surety on any bond furnished by CONTRACTOR is declared bankrupt or becomes insolvent or its right to do business is terminated in the State of Texas or it ceases to meet the requirements of the preceding paragraph, CONTRACTOR shall within ten (10) days thereafter substitute another bond and surety, both of which must be acceptable to OWNER.

.3 When Performance Bonds and/or Payment Bonds are required, each shall be issued in an amount of one hundred percent (100%) of the Contract Amount as security for the faithful performance and/or payment of all CONTRACTOR's obligations under the Contract Documents. Performance Bonds and Payment Bonds shall be issued by a solvent surety company authorized to do business in the State of Texas, and shall meet any other requirements established by law or by OWNER pursuant to applicable law. Any surety duly authorized to do business in Texas may write Performance and Payment Bonds on a project without reinsurance to the limit of ten percent (10%) of its capital and surplus. Such a surety must reinsure any obligations over ten percent (10%).

5.4.2 Performance Bond.

.1 If the Contract Amount exceeds $100,000, CONTRACTOR shall furnish OWNER with a Performance Bond in the form set out in Section 00610.

.2 If the Contract Amount exceeds $25,000 but is less than or equal to $100,000, CONTRACTOR shall furnish OWNER with a Performance Bond in the form set out in Section 00610, unless the original Contract Time is 60 Calendar Days/40 Working Days or less, in which case CONTRACTOR can agree to the following terms and conditions for payment in lieu of providing a Performance Bond: no moneys will be paid to CONTRACTOR until completion and acceptance of the Work by OWNER; CONTRACTOR shall be entitled to receive 95% of the Contract Amount following Final Completion, and the remaining 5% of the Contract Amount following the one (1) year warranty period.

.3 If the Contract Amount is less than or equal to $25,000, CONTRACTOR will not be required to furnish a Performance Bond; provided that no moneys will be paid to CONTRACTOR until completion and acceptance of the Work by OWNER under the following terms and conditions: CONTRACTOR shall be entitled to receive 95% of the Contract Amount following Final Completion, and the remaining 5% of the Contract Amount following the one (1) year warranty period.

.4 If a Performance Bond is required to be furnished, it shall extend for the one (1) year warranty period.

5.4.3 Payment Bond.

.1 If the Contract Amount exceeds $50,000, CONTRACTOR shall furnish OWNER with a Payment Bond in the form set out in Section 00620.

.2 If the Contract Amount is less than or equal to $50,000, CONTRACTOR will not be required to furnish a Payment Bond; provided that no moneys will be paid to CONTRACTOR until completion and acceptance of the Work by OWNER under the terms and conditions specified in paragraph 5.4.2.3.

5.4.4 **Maintenance Bond:** If the Contract Documents contemplate a period of maintenance beyond the one (1) year contractual warranty period, OWNER agrees that any bond to be required for such maintenance work will be in the amount of the maintenance work during any extended maintenance period.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.1 Supervision and Superintendence:

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

6.1.2 CONTRACTOR shall have a competent, qualified Superintendent on the Work at all times that work is in progress. To be qualified, at a minimum, the Superintendent must be effective at (a) communicating both verbally and in writing with the OWNER's representative; (b) receiving and fulfilling instructions from the Owner's Representative; (c) supervising and directing the construction of the Work; (d) reading and interpreting the plans and specifications; (e) writing, preparing and submitting necessary paperwork; and (f) understanding work sequencing and scheduling. The Superintendent will be CONTRACTOR's representative on the Work and shall have the authority to act on the behalf of CONTRACTOR. All communications given to the Superintendent shall be as binding as if given to CONTRACTOR. Either CONTRACTOR or the Superintendent shall provide a cellular telephone number and an emergency and home telephone number at which one or the other may be reached if necessary when work is not in progress. The Superintendent must be an employee of the CONTRACTOR, unless such requirement is waived in writing by the Owner's Representative. If the CONTRACTOR proposes a management structure with a Project Manager supervising, directing, and managing construction of the work in addition to or in substitution of a Superintendent, the requirements of these Construction Documents with respect to the Superintendent shall likewise apply to any such Project Manager.

.1 CONTRACTOR shall present the resume of the proposed Superintendent to the Owner's Representative showing evidence of experience and successful superintendence and direction of work of a similar scale and complexity. If, in the opinion of the Owner's Representative, the proposed Superintendent does

not indicate sufficient experience in line with the Work, he/she will not be allowed to be the designated Superintendent for the Work.

.2 The Superintendent shall not be replaced without Written Notice to Owner's Representative. If CONTRACTOR deems it necessary to replace the Superintendent, CONTRACTOR shall provide the necessary information for approval, as stated above, on the proposed new Superintendent.

.3 A qualified substitute Superintendent may be designated in the event that the designated Superintendent is temporarily away from the Work, but not to exceed a time limit acceptable to the Owner's Representative. CONTRACTOR shall replace the Superintendent upon OWNER's request in the event the Superintendent is unable to perform to OWNER's satisfaction.

6.2 Labor, Materials and Equipment:

6.2.1 CONTRACTOR shall maintain a work force adequate to accomplish the Work within the Contract Time. CONTRACTOR agrees to employ only orderly and competent workers, skillful in performance of the type of Work required under this Contract. CONTRACTOR, Subcontractors, Sub-subcontractors, and their employees may not use or possess any alcoholic or other intoxicating beverages, illegal drugs or controlled substances while on the job or on OWNER's property, nor may such workers be intoxicated, or under the influence of alcohol or drugs, on the job. Subject to the applicable provisions of Texas law, CONTRACTOR, Subcontractors, Sub-subcontractors, and their employees may not use or possess any firearms or other weapons while on the job or on OWNER'S property. If OWNER or Owner's Representative notifies CONTRACTOR that any worker or representative of Contractor is incompetent, disorderly, abusive, or disobedient, has knowingly or repeatedly violated safety regulations, has possessed any firearms in contravention of the applicable provisions of Texas law, or has possessed or was under the influence of alcohol or drugs on the job, CONTRACTOR shall immediately remove such worker or representative, including an officer or owner of CONTRACTOR, from performing Contract Work, and may not employ such worker or representative again on Contract Work without OWNER's prior written consent. CONTRACTOR shall at all times maintain good discipline and order on or off the site in all matters pertaining to the Project. Workers on Project shall be paid not less than wage rates, including fringe benefits, as published by the Department of Labor (DOL) for Building Construction and Heavy and Highway Trades "AS APPLICABLE" and/or the minimum wage required by City of Austin Ordinance No. 20160324-015, whichever is higher. The Total Minimum Wage required can be met using any combination of cash and non-cash qualified fringe benefits provided the cash component meets or exceeds the minimum wage required.

6.2.2 Unless otherwise specified in Division 1, CONTRACTOR shall provide and pay for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

6.2.3 All materials and equipment shall be of good quality and new (including new products made of recycled materials, pursuant to Section 361.426 of the Texas Health & Safety Code), except as otherwise provided in the Contract Documents. If required by Owner's Representative, CONTRACTOR shall furnish satisfactory evidence (reports of required tests, manufacturer's certificates of compliance with material requirements, mill reports, etc.) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected,

erected, used, cleaned and conditioned in accordance with instructions of the applicable Supplier, except as otherwise provided in the Contract Documents.

6.2.4 Substitutes and "Approved Equal" Items:

.1 Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function and quality required. Unless the specification or description contains words reading that no like, equivalent or "approved equal" item or no substitution is permitted, other items of material or equipment of other Suppliers may be submitted by CONTRACTOR, at CONTRACTOR'S sole risk, including disruptions to the Critical Path of the Progress Schedule, to E/A through Owner's Representative under the following circumstances:

.1.1 "Approved Equal": If in E/A's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by E/A as an "approved equal" item, in which case review of the proposed item may, in E/A's sole discretion, be accomplished without compliance with some or all of the requirements for evaluation of proposed substitute items. CONTRACTOR shall provide E/A with the documentation required for E/A to make its determination.

.1.2 Substitute Items: If in E/A's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "approved equal" item under subparagraph 6.2.4.1.1, it will be considered a proposed substitute item. CONTRACTOR shall submit sufficient information as provided in Division 1 to allow E/A to determine that the item of material or equipment proposed is essentially equivalent to that named and a substitute therefor.

.2 Substitute Construction Methods and Procedures: If a specific means, method, technique, sequence or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may, at CONTRACTOR'S sole risk, including disruptions to the Critical Path of the Progress Schedule, with prior approval of E/A furnish or utilize a substitute means, method, technique, sequence, or procedure of construction. CONTRACTOR shall submit sufficient information to Owner's Representative to allow E/A, in E/A's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review by E/A will be same as that provided for substitute items in Division 1.

.3 E/A's Evaluation: E/A will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to subparagraphs 6.2.4.1.1 and 6.2.4.1.2. E/A will be the sole judge of acceptability. No "approved equal" or substitute shall be ordered, installed, or utilized until E/A's review is complete, which will be evidenced by either a Change Order or completion of the Shop Drawing review procedure. OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety bond with respect to any "approved equal" or substitute or for any other delay or disruption to the Critical Path of the Project Schedule attributable to any such substitution. OWNER shall not be responsible for any delay due to review time for any "approved equal" or substitute.

.4 CONTRACTOR's Expense: All data and documentation to be provided by CONTRACTOR in support of any proposed "approved equal" or substitute item will be at CONTRACTOR's expense.

.5 The approval of the E/A will not relieve the CONTRACTOR from primary responsibility and liability for the suitability and performance of any proposed substitute item, method or procedure and will not relieve CONTRACTOR from its primary responsibility and liability for curing defective Work and performing warranty work, which the CONTRACTOR shall cure and perform, regardless of any claim the CONTRACTOR may choose to advance against the E/A or manufacturer.

6.2.5 CONTRACTOR agrees to assign to OWNER any rights it may have to bring antitrust suits against its Suppliers for overcharges on materials incorporated in the Project growing out of illegal price fixing agreements. CONTRACTOR further agrees to cooperate with OWNER should OWNER wish to prosecute suits against Suppliers for illegal price fixing.

6.3 Progress Schedule: Unless otherwise provided in Division 1, CONTRACTOR shall adhere to the Baseline Schedule established in accordance with paragraph 2.6 as it may be adjusted from time to time as provided below:

6.3.1 CONTRACTOR shall submit to Owner's Representative for review and approval any proposed adjustments in the Progress Schedule that will not change the Contract Times or Milestones on a monthly basis. Any such proposed adjustments must be substantiated with documentation of any changes to the underlying logic of the Progress Schedule. CONTRACTOR's Progress Schedule must show how the CONTRACTOR will consistently advance the progress of the Work in accordance with the Critical Path of the Work and the Contract Time or Milestones. Such adjustments will conform generally to the Progress Schedule then in effect and additionally will comply with any provisions of Division 1 applicable thereto.

6.3.2 Proposed adjustments in the Progress Schedule that will change the Contract Times or Milestones shall be submitted in accordance with the requirements of Article 12. Any such proposed adjustments must be substantiated with documentation of any changes to the underlying logic of the Progress Schedule. Such adjustments may only be made by a Change Order or Time Extension Request in accordance with Article 12.

6.4 Concerning Subcontractors, Suppliers and Others:

6.4.1 Assignment: CONTRACTOR agrees to retain direct control of and give direct attention to the fulfillment of this Contract. CONTRACTOR agrees not to, by Power of Attorney, or otherwise, assign said Contract without the prior written consent of OWNER. In addition, without OWNER'S written consent, the CONTRACTOR will not subcontract the performance of the entire Work or the supervision and direction of the Work.

6.4.2 Award of Subcontracts for Portions of the Work: CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization, whether initially or as a substitute, against whom OWNER may have reasonable objection. OWNER will communicate such objections by Written Notice. If OWNER requires a change without good cause of any Subcontractor, person or organization previously accepted by OWNER, the Contract Amount shall be increased or decreased by the difference in the cost occasioned by any such change, and appropriate Change Order shall be issued. CONTRACTOR shall not substitute any Subcontractor, person or

organization that has been accepted by OWNER, unless the substitute has been accepted in writing by OWNER. No acceptance by OWNER of any Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of OWNER to reject defective Work.

6.4.3 CONTRACTOR shall enter into written agreements with all Subcontractors and Suppliers which specifically binds the Subcontractors or Suppliers to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and E/A. The OWNER reserves the right to specify that certain requirements shall be adhered to by all Subcontractors and Sub-subcontractors as indicated in other portions of the Contract Documents and these requirements shall be made a part of the agreement between CONTRACTOR and Subcontractor or Supplier. Subject to and in accordance with the above requirements, the CONTRACTOR must provide and will be deemed for all purposes to have provided in its contracts with major Subcontractors or Suppliers on the Project (those contracts of more than $10,000) the following specific provision: alternative dispute resolution (paragraphs 16.2 and 16.3), which shall be mandatory in the event of a subcontractor or supplier claim and a prerequisite for the submission of any derivative claim. The CONTRACTOR's standard subcontract form is subject to the OWNER's review and approval. The OWNER may request and the CONTRACTOR will provide within five (5) working days a copy of any subcontract requested by the OWNER.

6.4.4 CONTRACTOR shall be fully responsible to OWNER for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier or other person or organization any contractual relationship between OWNER and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of OWNER or E/A to pay or to see to the payment of any moneys due any such Subcontractor, Supplier or other person or organization except as may otherwise be required by laws and regulations.

6.4.5 CONTRACTOR shall be solely responsible for efficiently scheduling and coordinating the Work of Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR in order to avoid any delays or inefficiencies in the prosecution of the Work. CONTRACTOR shall require all Subcontractors, Suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with Owner's Representative through CONTRACTOR.

6.4.6 The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing or delineating the Work to be performed by any specific trade.

6.4.7 CONTRACTOR shall pay each Subcontractor and Supplier their appropriate share of payments made to CONTRACTOR not later than ten (10) Calendar Days of CONTRACTOR's receipt of payment from OWNER. Upon request from Owner, the CONTRACTOR has two (2) Working Days to provide documentation verifying Payment to Subcontractor(s). The CONTRACTOR is required to notify the Subcontractor(s) in writing of rejection of Application for Payment within two (2) Working Days following notification by Owner. Failure of CONTRACTOR to make payments to Subcontractors or for labor, materials or equipment in accordance to this contract, may be cause to reject future Bids by the CONTRACTOR in accordance

with Section 00100 9.2.4 and may be cause to reject payment in accordance with 00700 14.4.1.3.

6.4.8 To the extent allowed by Texas law, the OWNER shall be deemed to be a third party beneficiary to each subcontract and may, if OWNER elects, following a termination of the CONTRACTOR, require that the Subcontractor(s) perform all or a portion of unperformed duties and obligations under its subcontract(s) for the benefit of the OWNER, rather than the CONTRACTOR; however, if the OWNER requires any such performance by a Subcontractor for the OWNER's direct benefit, then the OWNER shall be bound and obligated to pay such Subcontractor the reasonable value for all Work performed by such Subcontractor to the date of the termination of the CONTRACTOR, less previous payments, and for all Work performed thereafter. In the event that the OWNER elects to invoke its right under this section, OWNER will provide notice of such election to the CONTRACTOR and the affected Subcontractor(s).

6.5 Patent Fees and Royalties:

6.5.1 CONTRACTOR shall be responsible at all times for compliance with applicable patents or copyrights encompassing, in whole or in part, any design, device, material, or process utilized, directly or indirectly, in the performance of the Work or the formulation or presentation of its Bid.

6.5.2 CONTRACTOR shall pay all royalties and license fees and shall provide, prior to commencement of Work hereunder and at all times during the performance of same, for lawful use of any design, device, material or process covered by letters, patent or copyright by suitable legal agreement with the patentee, copyright holder, or their duly authorized representative whether or not a particular design, device, material, or process is specified by OWNER.

6.5.3 CONTRACTOR shall defend all suits or claims for infringement of any patent or copyright and shall save OWNER harmless from any loss or liability, direct or indirect, arising with respect to CONTRACTOR's process in the formulation of its Bid or the performance of the Work or otherwise arising in connection therewith. OWNER reserves the right to provide its own defense to any suit or claim of infringement of any patent or copyright in which event CONTRACTOR shall indemnify and save harmless OWNER from all costs and expenses of such defense as well as satisfaction of all judgments entered against OWNER.

6.5.4 OWNER shall have the right to stop the Work and/or terminate this Agreement at any time in the event CONTRACTOR fails to disclose to OWNER that CONTRACTOR's work methodology includes the use of any infringing design, device, material or process.

6.6 Permits, Fees: Unless otherwise provided in the Supplemental General Conditions, CONTRACTOR shall obtain and pay for all construction permits, licenses and fees required for prosecution of the Work.

6.7 Laws and Regulations:

6.7.1 CONTRACTOR shall give all notices and comply with all laws and regulations applicable to furnishing and performing the Work, including arranging for and

obtaining any required inspections, tests, approvals or certifications from any public body having jurisdiction over the Work or any part thereof. Except where otherwise expressly required by applicable laws and regulations, neither OWNER nor E/A shall be responsible for monitoring CONTRACTOR's compliance with any laws and regulations.

6.7.2 Maintaining clean water, air and earth or improving thereon shall be regarded as of prime importance. CONTRACTOR shall plan and execute its operations in compliance with all applicable Federal, State and local laws and regulations concerning control and abatement of water pollution and prevention and control of air pollution.

6.7.3 If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to laws or regulations, CONTRACTOR shall bear all claims, costs, losses and damages arising therefrom; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with laws and regulations, but this does not relieve CONTRACTOR of CONTRACTOR's obligations under Article 3.

6.8 Taxes:

6.8.1 CONTRACTOR shall pay only those sales, consumer, use and other similar taxes required to be paid by CONTRACTOR in accordance with the laws and regulations of the State of Texas in the performance of this public works contract.

6.8.2 OWNER is an exempt organization as defined by Chapter 11 of the Property Tax Code of Texas and is thereby exempt from payment of Sales Tax under Chapter 151, Limited Use Sales, Excise and Use Tax, Texas Tax Code, and Article 1066 (C), Local Sales and Use Tax Act, Revised Civil Statutes of Texas.

6.9 Use of Premises:

6.9.1 CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workers to the site and land and areas identified in and permitted by the Contract Documents and other land and areas permitted by laws and regulations, right-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any adjacent land or areas, resulting from the performance of the Work. Should any claim be made by any such owner or occupant because of or in connection with the performance of the Work, CONTRACTOR shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law. **CONTRACTOR shall indemnify, defend and hold harmless OWNER, E/A, E/A'S Consultants and anyone directly or indirectly employed by any of them from and against all claims, costs, losses and damages (including court costs and reasonable attorney's fees) arising out of or resulting from any claim or action, legal or equitable, brought by any such owner or occupant against OWNER, E/A or any other party indemnified hereunder to the extent caused by or based upon performance of the work or failure to perform the Work.**

6.9.2 During the progress of the Work and on a daily basis, CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work, CONTRACTOR shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery and surplus materials. CONTRACTOR shall leave the site clean and ready for occupancy by OWNER at Substantial Completion of the Work. CONTRACTOR shall, at a minimum, restore to original condition all property not designated for alteration by the Contract Documents. If the CONTRACTOR fails to clean up at the completion of the Work, OWNER may do so and the cost thereof will be charged against the CONTRACTOR.

6.9.3 CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.10 Record Documents: CONTRACTOR shall maintain in a safe place at the site, or other location acceptable to OWNER, one (1) record copy of all Drawings, Specifications, Addenda, Change Orders, Change Directives, Field Orders and written interpretations and clarifications (issued pursuant to paragraph 9.5) in good order and annotated to show all changes made during construction. These record documents together with all final samples and all final Shop Drawings will be available to OWNER and E/A for reference during performance of the Work. Upon Substantial Completion of the Work, these record documents, samples and Shop Drawings shall be promptly delivered to Owner's Representative.

6.11 Safety and Protection:

6.11.1 CONTRACTOR shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Upon request, and prior to installation of measures, CONTRACTOR shall submit a site security plan for approval by OWNER. By reviewing the plan or making recommendations or comments, OWNER will not assume liability nor will CONTRACTOR be relieved of liability for damage, injury or loss. CONTRACTOR shall take all necessary precautions for the safety of and shall provide the necessary protection to prevent damage, injury or loss to:

.1 all persons on the Work site or who may be affected by the Work;

.2 all the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and

.3 other property at the site or adjacent thereto, including, but not limited to, trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and underground facilities not designated for removal, relocation or replacement in the course of construction.

6.11.2 CONTRACTOR shall comply with all applicable laws and regulations of any public body having jurisdiction for safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of underground facilities, and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property referred to in paragraph 6.11.1.2 and 6.11.1.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, Subcontractor, Supplier or any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings or

Specifications or to the acts or omissions of OWNER, or E/A, or E/A's consultant or anyone employed by any of them or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the faults or negligence of CONTRACTOR or any Subcontractor, Supplier or other person or organization directly or indirectly employed by any of them). CONTRACTOR's duties and responsibilities for safety and protection of the Work shall continue until such time as all the Work is completed and Owner's Representative has issued a notice to OWNER and CONTRACTOR in accordance with Article 14 that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion). Without limitation, CONTRACTOR shall comply with the following specific provisions:

It shall be the duty and responsibility of CONTRACTOR and all of its subcontractors to be familiar with and comply with 29 USC Section 651, et seq., the Occupational Safety and Health Act of 1970, as amended ("OSHA") and to enforce and comply with all provisions of this Act.

The CONTRACTOR and all of its subcontractors shall comply with all applicable requirements of Subpart P of Part 1926 of 29 C.F.R, OSHA Safety and Health Standards, Texas Health and Safety Code Section 756.023, as amended, and shall submit a unit price for the particular excavation safety systems to be utilized by the Contractor for all excavations which exceed a depth of five feet (5').

Before commencing any excavation which will exceed a depth of five feet (5'), the CONTRACTOR shall provide the Owner with detailed plans and specifications regarding the safety systems to be utilized. Said plans and specifications shall include a certification from a Texas licensed professional engineer indicating full compliance with the OSHA provisions cited above.

6.11.3 Safety Representative: CONTRACTOR shall designate in writing a qualified and experienced safety representative (the "Safety Representative") at the site whose duties and responsibilities shall include safety training; identifying and mitigating hazardous conditions and unsafe work practices; and developing, maintaining and supervising the implementation of safe work practices and safety programs as deemed necessary and appropriate for the Project. The term "Safety Representative" includes any designated Safety Supervisor, Superintendent or Safety Manager. The Safety Representative shall exercise due diligence in the execution of all Project related safety duties. Upon request of OWNER, CONTRACTOR shall provide certifications or other acceptable documentation of the Safety Representative's qualifications. The following requirements will be effective as of September 1, 2010:

.1 The Safety Representative shall present certification of completion of the OSHA 30-hour Construction Industry Training Outreach Program described at: http://www.osha.gov/dte/outreach/construction_generalindustry/construction.html

.2 The Safety Representative shall verify that all construction workers (defined as persons covered by a prevailing wage determination) on the job site, whether employed by the CONTRACTOR or subcontractors, have completed the OSHA 10-hour Construction Industry Training Outreach Program described at: http://www.osha.gov/dte/outreach/construction_generalindustry/construction.html. The Safety Representative must receive a certificate of training completion before allowing a worker on site and shall have all such certificates available for inspection by the OWNER.

.3 The Safety Representative shall ensure that workers, including designated competent persons, have completed all applicable OSHA specific or other training needed to perform their job assignments. Training topics applicable

to the scope of the current Project may include, but are not limited to, scaffolds, fall protection, cranes, excavations, electrical safety, tools, concrete and masonry construction, steel erection, operation of motor vehicles and mechanized equipment.

.4 The Safety Representative shall post notice on the site of the Work stating that all workers shall have completed OSHA Construction Industry Training. The Owner may require, and the Safety Representative should consider providing a means of readily identifying workers who have completed the required training to monitor compliance with these requirements.

.5 The Safety Representative shall ensure that all required OSHA and Workers Compensation notices to workers are posted in English and Spanish at one or more conspicuous locations on the work site.

6.11.4 Hazard Communication Programs: CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the site in accordance with laws and regulations.

6.11.5 Emergencies:

.1 In emergencies affecting the safety or protection of persons or the Work at the site or adjacent thereto, CONTRACTOR, without special instruction or authorization from OWNER or E/A, is obligated to act reasonably to prevent threatened damage, injury or loss and to mitigate damage or loss to the Work. CONTRACTOR shall give Owner's Representative telephone notification as soon as reasonably practical and a prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If Owner's Representative determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to such an emergency, a Change Directive or Change Order will be issued to document the consequences of such action; otherwise OWNER will not be responsible for CONTRACTOR's emergency action.

.2 Authorized agents of CONTRACTOR shall respond immediately to call-out at any time of any day or night when circumstances warrant the presence on Project site of CONTRACTOR or his agent to protect the Work or adjacent property from damage, restriction or limitation or to take such action or measures pertaining to the Work as may be necessary to provide for the safety of the public. Should CONTRACTOR and/or their agent fail to respond and take action to alleviate such an emergency situation, OWNER may direct other forces to take action as necessary to remedy the emergency condition, and OWNER will deduct any cost of such remedial action from the funds due CONTRACTOR under this Contract.

.3 In the event there is an accident involving injury to any individual or damage to any property on or near the Work, CONTRACTOR shall provide to Owner's Representative verbal notification within one (1) hour and written notification within twenty-four (24) hours of the event and shall be responsible for recording the location of the event and the circumstances surrounding the event through photographs, interviewing witnesses, obtaining medical reports, police accident reports and other documentation that describes the event. Copies of such documentation shall be provided to Owner's Representative, for OWNER's and E/A's records, within forty-eight (48) hours of the event.

Contractor shall cooperate with OWNER on any OWNER investigation of any such incident.

6.11.6 Rest Breaks:

.1 Except as provided in subsection 6.11.6.2 below, an employee performing construction activity at a construction site is entitled to a rest break of not less than ten (10) minutes for every four (4) hours worked. No employee may be required to work more than 3.5 hours without a rest break. A rest break means a break from work within working hours, excluding meal breaks, during which an employee may not work. A rest break shall be scheduled as near as possible to the midpoint of the work period.

.2 An employee is not entitled to a rest break under subsection 6.11.6.1 on any day the employee works less than 3.5 hours or spends more than half of his or her work time engaged in non-strenuous labor in a climate controlled environment.

.3 A sign describing the requirements of this Section 6.11.6 in English and Spanish shall be posted by the employer in each establishment subject to the requirement of a rest break in a conspicuous place or places where notices to employees are customarily posted, in accordance with the OWNER's then current rules for size, content, and location of such signage.

.4 The violation of Ordinance No. 20100729-047, enacted July 29, 2010, which establishes the rest break requirements set forth above, may be enforced with criminal penalties and civil remedies, as set forth in the Ordinance.

6.11.7 If the Contractor fails to carry out the Work in accordance with the Contract Documents so that a safety violation has occurred, the Owner may order 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 under this paragraph shall not give rise to a duty on the part of the Owner to supervise the Contractor's Work or to control the Contractor's means and methods or to exercise this right for the benefit of the Contractor or any other person or entity. All time lost due to Project shut down will be the Contractor's sole responsibility, will be charged against the Contract Time, and the Contractor will be responsible for any and all expenses incurred. This provision is in addition to and supplemental to the applicable provisions of the Project's ROCIP Safety Manual.

6.11.8 Confined Space Program

.1 Contractor acknowledges and agrees that the Owner is temporarily transferring management and control of the site of the Work to the Contractor for the purpose of constructing the Project. The Contractor's responsibilities to manage the Work includes the responsibility to manage the property for purposes of compliance with 29 CFR 1926 subpart AA. To the best of Owner's knowledge and belief, Owner has provided the following information in the plans and specifications and other Contract Documents: (i) the location of each known permit space, (ii) the hazards or potential hazards in each space or the reason it is a permit space; and (iii) any precautions that the Owner or any previous contractor has implemented for the protection of employees in the permit space. This transfer will result in the Contractor being both the host employer and the controlling contractor for this portion of the Work.

6.12 Continuing the Work: CONTRACTOR shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as OWNER and CONTRACTOR may otherwise agree in writing.

6.13 CONTRACTOR's General Warranty and Guarantee:

6.13.1 CONTRACTOR warrants and guarantees to OWNER that all Work will conform to the plans and specifications, be performed in a good and workmanlike manner in accordance with the Contract Documents and will not be defective. This warranty will survive the termination or expiration of the Contract. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

.1 abuse, modification or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors or Suppliers; or

.2 normal wear and tear under normal usage.

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

.1 observations by Owner's Representative and/or E/A;

.2 recommendation of any progress or final payment by Owner's Representative;

.3 the issuance of a certificate of Substantial Completion or any payment by OWNER to CONTRACTOR under the Contract Documents;

.4 use or occupancy of the Work or any part thereof by OWNER;

.5 any acceptance by OWNER or any failure to do so;

.6 any review of a Shop Drawing or sample submittal;

.7 any inspection, test or approval by others; or

.8 any correction of defective Work by OWNER.

6.14 INDEMNIFICATION:

6.14.1 CONTRACTOR shall defend, indemnify and hold harmless OWNER, E/A, E/A'S Consultants and Sub consultants and their respective officers, directors, partners, employees, agents and other Consultants and any of them (the "INDEMNIFIED PARTIES") from and against all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) arising out of or resulting from the performance of the Work, provided that any such claim, cost, loss or damage:

.1 Is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself), including the loss of use resulting therefrom, and

.2 Is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of the INDEMNIFIED PARTIES hereunder or whether liability is imposed upon such INDEMNIFIED PARTY by laws and regulations regardless of the negligence of any such person or entity.

In the event that indemnification of the INDEMNIFIED PARTIES is prohibited by law, CONTRACTOR shall nonetheless be solely responsible for any liability arising out of or resulting from the performance of the Work, subject to the limitations set forth above, and shall indemnify and hold harmless the remaining INDEMNIFIED PARTIES, who may be legally indemnified, from such liability of the CONTRACTOR and the associated costs described above.

6.14.2 The indemnification obligation under paragraph 6.14.1 shall not be limited in any way by any limitation on the amount or type of damages, or compensation or benefits payable by or for CONTRACTOR or any such Subcontractor, Supplier or other person or organization under workers' compensation acts, disability benefit acts or other employee benefit acts.

6.14.3 The obligations of CONTRACTOR under paragraph 6.14.1 shall not extend to the liability of OWNER, E/A, E/A's consultants, and their officers, directors, partners, employees or agents caused primarily by negligent preparation of maps, drawings, surveys, designs or specifications upon which is placed the applicable state-authorized design professional seal of OWNER's, E/A's or E/A's consultant's officers, directors, partners, employees or agents.

6.14.4 In the event CONTRACTOR fails to follow OWNER's directives concerning use of the site, scheduling or course of construction, or engages in other conduct which proximately causes damage to property based on inverse condemnation or otherwise, then and in that event, CONTRACTOR shall indemnify OWNER against all costs resulting from such claims.

6.14.5 In the event CONTRACTOR unreasonably delays progress of the work being done by others on the site so as to cause loss for

which OWNER becomes liable, then CONTRACTOR shall indemnify OWNER from and reimburse OWNER for such loss.

6.15 Survival of Obligations: All representations, indemnifications, warranties and guarantees made in, required by or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the Work and termination or completion of the Agreement.

6.16 **Losses from Natural Causes:** Unless otherwise specified, all loss or damage to CONTRACTOR arising out of the nature of the Work to be done or from action of the elements, floods or from unforeseeable circumstances in prosecution of the Work or from unusual obstructions or difficulties which may be encountered in prosecution of the Work, shall be sustained and borne by CONTRACTOR at its own cost and expense.

6.17 **Notice of Claim:** Should CONTRACTOR suffer injury or damage to person or property because of any error, omission or act of OWNER or of any of OWNER's employees or agents or others for whose acts OWNER is liable, a Claim must be made to the other party within thirty (30) calendar days of the event giving rise to such injury or damage. The provisions of this paragraph 6.17 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or statute of repose.

6.18 **Liquidated Damages:** CONTRACTOR or its Surety shall be liable for liquidated damages for the failure of the CONTRACTOR to timely complete the Work or any portion thereof within the Contract Time.

ARTICLE 7 - OTHER WORK

7.1 OWNER may perform other work related to the Project at the site by OWNER's own forces, or let other contracts therefor, or have other work performed by utility owners. CONTRACTOR and OWNER agree to and shall use best efforts to cooperate and coordinate the Work with others performing work and other work related to the Project in order to avoid conflicts and delays in the Work. If CONTRACTOR believes that delay or additional cost is involved because of such action by OWNER, CONTRACTOR may make a Claim as provided in Article 11 or 12.

7.2 CONTRACTOR shall afford other contractors who are in a contract with OWNER and each utility owner (and OWNER, if OWNER is performing the additional work with OWNER's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly connect and coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of Owner's Representative and the other contractors whose work will be affected. CONTRACTOR shall promptly remedy damage wrongfully caused by CONTRACTOR to completed or partially completed construction or to property of the OWNER or separate contractors.

7.3 If the proper execution or results of any part of CONTRACTOR's Work depends upon work performed by others under this Article 7, CONTRACTOR shall inspect such other work and promptly report to Owner's Representative in writing any delays, defects or deficiencies in

such other work that render it unavailable or unsuitable for the proper execution and results of CONTRACTOR's Work. CONTRACTOR's failure to report will constitute an acceptance of such other work as fit and proper for integration with CONTRACTOR's Work except for latent or non-apparent defects and deficiencies in such other work.

7.4 OWNER shall provide for coordination of the activities of the OWNER's own forces and of each separate contractor with the Work of CONTRACTOR, who shall cooperate with them. CONTRACTOR shall participate with other separate contractors and Owner's Representative in reviewing their construction Progress Schedules when directed to do so. On the basis of such review, CONTRACTOR shall make any revisions to the construction Progress Schedule deemed necessary after a joint review and mutual agreement. The agreed upon construction Progress Schedules shall then constitute the Progress Schedules to be used by CONTRACTOR, separate contractors and OWNER until subsequently revised.

7.5 Costs caused by delays or by improperly timed activities or defective construction shall be borne by the party responsible therefor.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.1 Prior to the start of construction, OWNER will designate in writing a person or entity to act as Owner's Representative during construction. Except as otherwise provided in these General Conditions, OWNER shall issue all communications to CONTRACTOR through Owner's Representative.

8.2 OWNER will not supervise, direct, control or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction or the safety precautions and programs incident thereto. OWNER is not responsible for any failure of CONTRACTOR to comply with laws and regulations applicable to furnishing or performing the Work. OWNER is not responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents. Failure or omission of OWNER to discover, or object to or condemn any defective Work or material shall not release CONTRACTOR from the obligation to properly and fully perform the Contract.

8.3 OWNER is not responsible for the acts or omissions of CONTRACTOR, or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work. CONTRACTOR acknowledges and agrees that OWNER'S direction to perform Work in accordance with the approved Progress Schedule is not a demand for acceleration or a dictation of CONTRACTOR'S means or methods.

8.4 Information or services under the OWNER's control shall be furnished by the OWNER with reasonable promptness to avoid delay in orderly progress of the Work. The OWNER shall have a reasonable amount of time to investigate site conditions, review submittals, analyze requests for changes, and to make other decisions in the orderly administration of the Contract. CONTRACTOR must notify the OWNER in writing, if the time for the investigation, review, analysis of any submittals, required for changes or otherwise required for OWNER'S decision, impacts in any way the Critical Path of the approved Progress Schedule.

8.5 The foregoing are in addition to other duties and responsibilities of the OWNER enumerated herein and especially those in respect to Article 4 (Availability of Lands; Subsurface and Physical Conditions; Reference Points), Article 7 (Other Work) and Article 14 (Payments to CONTRACTOR and Completion).

8.6 **Notice of Claim:** Should OWNER suffer injury or damage to person or property because of any error, omission or act of CONTRACTOR or of any of CONTRACTOR's employees or agents or others for whose acts CONTRACTOR is liable, a Claim will be made to the other

party within thirty (30) calendar days of receipt of actual or constructive notice of the event giving rise to such injury or damage. The provisions of this paragraph 8.6 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or statute of repose.

ARTICLE 9 - ENGINEER/ARCHITECT'S STATUS DURING CONSTRUCTION

9.1 E/A's Authority and Responsibilities:

9.1.1 The duties and responsibilities and the limitations of authority of E/A during construction, as set forth in the Contract Documents, may be assigned or assumed by the OWNER, but shall not be extended without written consent of OWNER and/or E/A. The assignment of any authority, duties or responsibilities to E/A under the Contract Documents, or under any agreement between OWNER and E/A, or any undertaking, exercise or performance thereof by E/A, is intended to be for the sole and exclusive benefit of OWNER and not for the benefit of CONTRACTOR, Subcontractor, Supplier, or any other person or organization, or for any surety or employee or agent of any of them.

9.1.2 E/A will not supervise, direct, control or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto. E/A is not responsible for any failure of CONTRACTOR to comply with laws and regulations applicable to the furnishing or performing the Work. E/A is not responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents. Failure or omission of E/A to discover, or object to or condemn any defective Work or material shall not release CONTRACTOR from the obligation to properly and fully perform the Contract.

9.1.3 E/A is not responsible for the acts or omissions of CONTRACTOR, or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

9.1.4 If OWNER and E/A agree, E/A will review the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds and certificates of inspection, tests and approvals and other documentation required to be delivered by Article 14, but only to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests and approvals that the results certified indicate compliance with, the Contract Documents.

9.1.5 The limitations upon authority and responsibility set forth in this paragraph 9.1 shall also apply to E/A's Consultants, Resident Project Representative and assistants.

9.2 E/A as Owner's Representative: E/A may be designated as the Owner's Representative under paragraph 8.1.

9.3 Visits to Site: If OWNER and E/A agree, E/A will make visits to the site at intervals appropriate to the various stages of construction as E/A deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of CONTRACTOR's executed Work. Based on information obtained during such visits and observations, E/A will endeavor for the benefit of OWNER to determine, in general, if the Work is proceeding in accordance with the Contract Documents. E/A will not be required to make exhaustive or continuous on-site

inspections to check the quality or quantity of the Work. E/A's efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and on-site observations, E/A will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defective Work. E/A's visits and on-site observations are subject to all the limitations on E/A's authority and responsibility set forth in paragraph 9.1.

9.4 Resident Project Representative: If OWNER and E/A agree, E/A will furnish a Resident Project Representative to assist E/A in providing more continuous observation of the Work. The responsibilities and authority and limitations of any such Resident Project Representative and assistants will be as provided in paragraph 9.1 and in the Supplemental General Conditions. OWNER may designate another representative or agent to represent OWNER at the site who is not E/A, E/A's consultant, agent or employee.

9.5 Clarifications and Interpretations: E/A may determine that written clarifications or interpretations of the requirements of the Contract Documents (in the form of drawings or otherwise) are necessary. Such written clarifications or interpretations will be consistent with the intent of and reasonably inferable from the Contract Documents, will be issued with reasonable promptness by Owner's Representative and will be binding on OWNER and CONTRACTOR. If OWNER or CONTRACTOR believes that a written clarification or interpretation justifies an adjustment in the Contract Amount or the Contract Times, OWNER or CONTRACTOR may make a Claim therefor as provided in Article 11 or 12.

9.6 Rejecting Defective Work: E/A will recommend that OWNER disapprove or reject Work which E/A believes to be defective, or believes will not produce a completed Project that conforms to the Contract Documents or will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

9.7 Shop Drawings: Refer to Division 1 for E/A's authority concerning Shop Drawings.

ARTICLE 10 - CHANGES IN THE WORK

10.1 Changes:

10.1.1 Without invalidating the Contract and without notice to any surety, OWNER may, at any time or from time to time, order additions, deletions or revisions in the Work. Such changes in the Work will be authorized by Change Order, Change Directive or Field Order. In the event that the OWNER and the CONRACTOR are unable to negotiate the terms of a Change Order for the performance of additional Work, the OWNER may, at its election, perform such additional Work with its own forces or with another contractor and such work will be considered "Other Work" in accordance with Article 7.

10.1.2 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and CONTRACTOR shall proceed promptly, unless otherwise provided in the Change Order, Change Directive or Field Order. CONTRACTOR’s proposals for changes in the Contract Amount and/or Contract Time shall be submitted within ten (10) Calendar Days of request by Owner’s Representative, including impacts to the approved Progress Schedule, unless Owner’s Representative grants an extension. OWNER will review each proposal and respond to CONTRACTOR within ten (10) Calendar Days. After review by OWNER, CONTRACTOR shall provide any supporting data requested by Owner’s Representative within seven (7) Calendar Days, unless Owner’s Representative grants an extension. OWNER will determine within seven (7) Calendar Days whether to pursue the change in Work.

10.1.3 CONTRACTOR shall not be entitled to an increase in the Contract Amount or an extension of the Contract Times with respect to any Work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in paragraphs 3.3.1 and 3.3.2, except in the case of an emergency as provided in paragraph 6.11.5 or in the case of uncovering Work as provided in paragraph 13.4.

10.1.4 Except in the case of an emergency as provided in paragraph 6.11.5, a Change Order or Change Directive is required before CONTRACTOR commences any activities associated with a change in the Work which, in CONTRACTOR 's opinion, will result in a change in the Contract Amount and/or Contract Times.

10.1.5 If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Amount or Contract Times) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR's responsibility, and the amount of each applicable Bond will be adjusted accordingly.

10.2 Change Orders:

10.2.1 OWNER and CONTRACTOR shall execute appropriate written Change Orders covering:

.1 a change in the Work;

.2 the amount of the adjustment in the Contract Amount, if any; and

.3 the extent of the adjustment in the Contract Time, if any.

10.2.2 An executed Change Order shall represent the complete, equitable, and final amount of adjustment in the Contract Amount and/or Contract Time owed to CONTRACTOR or OWNER as a result of the occurrence or event causing the change in the Work encompassed by the Change Order.

10.3 Change Directives:

10.3.1 Without invalidating the Contract, OWNER may, by written Change Directive, using the Force Account method, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Amount and Contract Time being adjusted as necessary. "Force Account" means a basis of payment for the direct performance of Work with payment based on the actual cost of the labor, equipment and materials furnished and consideration for overhead and profit as set forth in Section 11.5, below. A Change Directive shall be used in the absence of complete and prompt agreement on the terms of a Change Order. Where practicable, any items of Work that may be agreed upon, prior to the performance of Work under this Section, will be included in a separate Change Order. For example, the cost of the installation of additional asphalt may be agreed upon based on the unit prices in the Bid.

10.3.2 If the Change Directive provides for an adjustment to the Contract Amount, the adjustment shall be based on the method provided in paragraph 11.5.

10.3.3 A Change Directive shall be effective immediately and shall be recorded later by preparation and execution of an appropriate Change Order.

10.3.4 Upon receipt of a Change Directive, CONTRACTOR shall promptly proceed with the change in the Work involved, provided, prior to the commencement of any Work under this section, the CONTRACTOR must submit its proposed Work plan, anticipated schedule, and a list of its work force and equipment proposed to be

used in the Work for OWNER'S approval. Upon such approval, CONTRACTOR must promptly commence and make continuous progress in the Work. The OWNER reserves the right to withhold payment for low production or lack of progress.

10.4 Field Order:

10.4.1 Owner's Representative may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Amount or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These shall be accomplished by written Field Order and shall be binding on OWNER and on CONTRACTOR who shall perform the Work involved promptly.

10.4.2 If CONTRACTOR believes that a Field Order would require an adjustment in the Contract Amount and/or Contract Times, CONTRACTOR shall make a prompt written request to Owner's Representative for a Change Order. Any request by CONTRACTOR for an adjustment in Contract Amount and/or Contract Times must be made in writing prior to beginning the work covered by the Field Order.

10.5 No Damages for Delay: CONTRACTOR shall receive no compensation for delays or hindrances to the Work, except when direct and unavoidable extra cost to CONTRACTOR is caused by failure of OWNER to provide information or material, if any, which is to be furnished by OWNER or access to the Work and only to the extent that such acts continue after the CONTRACTOR furnishes OWNER with written notice of such failure. When such extra compensation is claimed a written statement thereof shall be presented by CONTRACTOR to OWNER and if by OWNER found correct shall be approved. If delay is caused by specific orders given by OWNER to stop work or by performance of extra Work or by failure of OWNER to provide material or necessary instructions for carrying on the Work, then such delay will entitle CONTRACTOR to an equivalent extension of time, CONTRACTOR's application for which shall, however, be subject to approval of OWNER. No such extension of time shall release CONTRACTOR or surety on its performance bond from all CONTRACTOR's obligations hereunder which shall remain in full force until discharge of the Contract. In no event shall the CONTRACTOR be entitled to any compensation or recovery of any special damages in connection with any delays, including without limitation: consequential damages, lost opportunity costs, impact damages, or other similar damages. The OWNER'S exercise of any of its rights or remedies under the Contract Documents (including without limitation ordering changes in the Work, or directing suspension, rescheduling, or correction of the Work), regardless of the extent or frequency of the OWNER'S exercise of such rights or remedies, shall not be construed as active interference in the CONTRACTOR'S performance of the Work. Except as otherwise provided herein, an extension of Contract Time, to the extent permitted under Article 12, shall be the sole remedy of the CONTRACTOR for any acknowledged delays.

ARTICLE 11 - CHANGE OF CONTRACT AMOUNT

11.1 The Contract Amount is stated in the Agreement and, including authorized adjustments, is the total amount payable by OWNER to CONTRACTOR for performance of the Work under the Contract Documents.

11.2 The original Contract Amount may not be increased by more than twenty-five percent (25%) and it may not be decreased more than twenty-five percent (25%) without the consent of the CONTRACTOR to such decrease, except in the event of a termination for convenience under paragraph 15.2 or the failure of the City Council to appropriate sufficient

funding for the Project, in which events it is agreed that the consent of the CONTRACTOR will not be required.

11.3 The Contract Amount shall only be changed by a Change Order. Any claim for an adjustment in the Contract Amount shall be made by Written Notice delivered by the party making the Claim to the other party promptly (but in no event later than thirty (30) calendar days) after the start of the occurrence or event giving rise to the Claim and stating the general nature of the Claim. Notice of the amount of the Claim with supporting data shall be delivered within thirty (30) calendar days after Written Notice of Claim is delivered by claimant, and shall represent that the adjustment claimed covers all known amounts to which claimant is entitled as a result of said occurrence or event. If OWNER and CONTRACTOR cannot otherwise agree, all Claims for adjustment in the Contract Amount shall be determined as set out in Article 16.

11.4 Determination of Value of Work:

11.4.1 The value of any Work covered by a Change Order for an adjustment in the Contract Amount will be determined by one or more of the following methods:

.1 by application of unit prices contained in the Contract Documents to the quantities of the items involved.

.2 by a mutually agreed unit price, or lump sum properly itemized and supported by sufficient substantiating data, including documentation by subcontractors performing the work, to permit evaluation.

.3 by cost of Work plus CONTRACTOR's fee for all overhead costs and profit (determined as provided in paragraph 11.5).

.4 No cost will be included in the change order for time spent preparing the change order, nor will costs be included for an estimate of time to negotiate the change order costs for machinery, tools, or equipment as described in subparagraph 11.5.3

11.4.2 Before using the method described in paragraph 11.4.1.3, OWNER and CONTRACTOR agree to negotiate a Change Order using the methods identified in paragraphs 11.4.1.1 and 11.4.1.2, as appropriate, to determine the adjustment in the Contract Amount.

11.5 Cost of Work: If neither of the methods defined in paragraphs 11.4.1.1 nor 11.4.1.2 can be agreed upon before a change in the Work is commenced which will result in an adjustment in the Contract Amount, then the change in the Work will be performed by Change Directive, using the Force Account method, and payment will be made as follows:

11.5.1 For all personnel, CONTRACTOR will receive actual field cost wage rates for each hour that said personnel are actually engaged in such Work, as substantiated by its certified payroll, to which will be added an amount equal to twenty-five percent (25%) of the sum thereof as compensation for CONTRACTOR's total overhead, profit, and small tools. No separate charge will be made by CONTRACTOR or its Subcontractor(s) for organization or overhead expenses. In no case will the rate of wage be less than the minimum shown in the Contract for a particular category. CONTRACTOR will also receive an amount equal to 55% of the wages paid personnel, excluding the 25% compensation provided above, for CONTRACTOR’s and any effected Subcontractor’s cost of premiums on public liability insurance, workers' compensation insurance, social security and unemployment insurance. The cost for superintendence, project management, and other salaried employees are considered as included in the twenty five percent (25%) total overhead, profit, and small tools mark-up unless considered necessary and ordered by Owner.

11.5.2 CONTRACTOR will receive the actual cost, including freight charges, of the materials used and installed on such Work, to which costs will be added a sum equal to twenty-five percent (25%) thereof as compensation for CONTRACTOR's and any affected Subcontractor's total overhead and profit. In case material invoices indicate a discount may be taken, the actual cost will be the invoice price minus the discount.

11.5.3 For machinery, trucks, power tools, or other similar equipment (the "equipment") agreed to be necessary by OWNER and CONTRACTOR, OWNER will allow CONTRACTOR the Regional and Model Year adjusted Monthly Ownership Cost divided by 176 plus the Hourly Estimated Operating Costs as given in the latest edition of the "Rental Rate Blue Book" as published by EquipmentWatch (1-800-669-3282) for each hour that said equipment is in use on such work. The established equipment rates will be paid for each hour that the equipment is utilized in the Work. In the event that the equipment is used intermittently during the Work, full payment for an eight-hour day will be made if the equipment is not idle more than four (4) hours of the day. If the equipment is idle more than four (4) hours in a day, then payment will be made only for the actual hours worked. No additional compensation will be allowed on the equipment for CONTRACTOR's or any affected Subcontractor's overhead and profit. OWNER may accept an actual rental invoice in lieu of the method of calculation set forth in paragraph 11.5.3 for equipment rented exclusively for Force Account Work or for equipment not included in the Rental Rate Blue Book.

11.5.4 For Subcontractors, CONTRACTOR will receive the approved actual invoice cost plus 5% as compensation for CONTRACTOR's total overhead and profit.

11.5.5 CONTRACTOR will receive an additional 1% of the total of 11.5.1, 11.5.2, 11.5.3, and 11.5.4 as compensation for increased bond costs.

11.5.6 The compensation, as herein provided for, shall be received by CONTRACTOR and any affected Subcontractor as payment in full for work done by Change Directive and will include use of small tools, and total overhead expense and profit. CONTRACTOR and Owner's Representative shall compare records of work done by Change Directive at the end of each day. Copies of these records will be made upon forms provided for this purpose by OWNER and signed by both Owner's Representative and CONTRACTOR, with one copy being retained by OWNER and one by CONTRACTOR. Refusal by CONTRACTOR to sign these records within two (2) working days of presentation does not invalidate the accuracy of the record.

11.6 Unit Price Work:

11.6.1 Where the Contract Documents provide that all or part of the Work is to be unit price Work, initially the Contract Amount will be deemed to include for all unit price work an amount equal to the sum of the established unit price for each separately identified item of unit price work times the estimated quantity of each item as indicated in the Bid. The estimated quantities of items of unit price work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Amount. Determinations of the actual quantities and classifications of unit price work performed by CONTRACTOR will be made by Owner's Representative. Owner's Representative will review with CONTRACTOR the preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise).

11.6.2 When "plan quantity" is indicated for a Bid item, CONTRACTOR shall be paid amount specified in the Contract Documents without any measurements.

11.6.3 Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

11.6.4 A Major Item is any individual Bid item in the Bid that has a total cost equal to or greater than five percent (5%) of the original Contract Amount or $50,000, whichever is greater, computed on the basis of Bid quantities and Contract unit prices.

11.6.5 OWNER or CONTRACTOR may make a Claim for an adjustment in the Contract Amount in accordance with Article 11 if:

.1 the actual quantity of any Major Item should become as much as twenty percent (20%) more than or twenty percent (20%) less than that in the Bid; or

.2 CONTRACTOR presents documentation contesting accuracy of "plan quantity" and Owner's Representative verifies quantity and determines original value is in error by five percent (5%) or more;

Provided, however, in the event a Major Item is reduced by twenty percent (20%) or more of the amount in the Bid, no additional Article 11 profit or overhead will be added, if, due to other additions in the Work, the net value of the Contract Amount is not reduced.

ARTICLE 12 - CHANGE OF CONTRACT TIMES

12.1 Working Day and Calendar Day Contracts:

12.1.1 The Contract Times (or Milestones) may only be changed by Change Order or Time Extension Request duly executed by both CONTRACTOR and Owner's Representative. Any claim for an adjustment of the Contract Times (or Milestones) shall be made by Written Notice delivered by the party making the Claim to the other party promptly (but in no event later than thirty (30) calendar days after the start of the occurrence or event giving rise to the delay) and stating the general nature of the delay. Notice of the extent of the delay with supporting data shall be delivered within thirty (30) calendar days after Written Notice of Claim is delivered by claimant, and shall represent that the adjustment claimed is the entire adjustment to which claimant is entitled as a result of said occurrence or event. If OWNER and CONTRACTOR cannot otherwise agree, all Claims for adjustment in the Contract Times (or Milestones) shall be determined as set out in Article 16. No Claim for an adjustment in the Contract Times (or Milestones) will be valid if not submitted in accordance with the requirements of this paragraph.

12.1.2 When CONTRACTOR is at fault and OWNER stops the Work, so that corrections in the Work can be made by CONTRACTOR, no extension in time will be allowed.

12.1.3 When CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay. If performance by the CONTRACTOR or OWNER is interrupted by any occurrence not occasioned by its own conduct, whether such occurrence be an act of god or the result of war, riot, civil commotion, sovereign conduct, or the conduct of a third party, then such performance will be excused for a period of time necessary to remedy its effects, provided, however, in such an

event, a conference will be held within three (3) business days to establish a proposed new Progress Schedule for the Project.

12.1.4 OWNER will consider time extension requests and may grant CONTRACTOR an extension of time because of:

.1 Changes ordered in the work which justify additional time.

.2 Failure of materials or products being at the Project site due to delays in transportation or failures of Suppliers, which are not the result of CONTRACTOR's, Subcontractor's or Supplier's negligence. The request for an extension of time shall be supported by a citation of acts demonstrating that the delays are beyond CONTRACTOR's control, including, but not limited to, CONTRACTOR's efforts to overcome such delays documented as follows:

a) Copy of purchase order for delayed item(s) indicating date ordered by CONTRACTOR/ Subcontractor and date purchase order received by Supplier.

b) If item(s) require Shop Drawings or other submittal information in accordance with the Contract Documents, provide record of date submittal(s) forwarded to Owner's Representative, date submittal(s) returned to CONTRACTOR, and date submittal(s) forwarded to Supplier.

c) Copy of document(s) from Supplier, on Supplier's letterhead, indicating date(s) item(s) would be ready for shipment and/or actual shipment date(s).

d) Copies of all correspondence between CONTRACTOR / Subcontractor and Supplier indicating CONTRACTOR / Subcontractor's efforts to expedite item(s).

e) If item(s) are being purchased by a Subcontractor, provide correspondence, meeting notes, etc., that reflect CONTRACTOR's efforts with the Subcontractor to expedite delivery of the item(s).

.3 When acts of OWNER, E/A, utility owners or other contractors employed by OWNER delay progress of work through no fault of CONTRACTOR. The CONTRACTOR will only be entitled to an extension of time for delays that affect the Critical Path of the Work and that are not caused by the CONTRACTOR.

.4 When CONTRACTOR is delayed by strikes, lockouts, fires, losses from natural causes, or other unavoidable cause or causes beyond CONTRACTOR's control.

12.2 Calendar Day Contracts:

12.2.1 Under a Calendar Day Contract, CONTRACTOR may be granted an extension of time because of unusual inclement weather, including but not limited to unusual rainfall events, which are beyond the normal rainfall recorded and expected for Austin, Texas. However, the CONTRACTOR will not be granted an extension of time for "normal rainfall", as described below.

12.2.2 "Unusual Inclement Weather" is defined as a rain event or other weather related event which occurs at the site and is of sufficient magnitude to prevent CONTRACTOR from performing units of Work critical to maintaining the Progress Schedule.

12.2.3 Baseline Rain Day Determination. "Normal rainfall" compiled by the State climatologist, based on U.S. Weather Bureau Records for Austin, Texas, is considered a part of the Calendar Day Contract, and is not a justification for an extension of time. Listed below are the number of days in each month for which no compensatory days for rainfall events ("Rain Days") in such months may be claimed:

January..... 8 days

February..... 8 days

March..... 7 days

April..... 7 days

May..... 9 days

June..... 6 days

July..... 5 days

August..... 5 days

September..... 7 days

October..... 7 days

November..... 7 days

December..... 7 days

Rain Days in addition to the baseline Rain Day determination described above will be measured with the Owner's Representative's approval at the nearest operational public weather data collection facility to the site, including but not limited to the OWNER's early warning flood gauge system.

12.2.4 CONTRACTOR may receive credit in any month for Unusual Inclement Weather, and specifically for any Rain Days in that month which exceed the number of Rain Days allocated to that month, if a Claim is made in accordance with paragraph 12.1.1 and the weather event meets the definition for "Unusual Inclement Weather", and as applicable, "Rain Day" and such claimed day is a day on which Work critical to maintaining the Progress Schedule is scheduled to be performed and is otherwise capable of being performed.

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

13.1 Notice of Defects: Prompt notice of all defective Work of which OWNER or E/A has actual knowledge will be given to CONTRACTOR. All defective Work may be rejected, corrected or accepted as provided in Article 13. CONTRACTOR must give OWNER and E/A prompt notice of any defective Work of which CONTRACTOR has actual knowledge.

13.2 Access to Work: OWNER, E/A, E/A's Consultants, other representatives and personnel of OWNER, independent testing laboratories and governmental agencies having jurisdiction will have access to the Work at reasonable times for observing, inspecting and testing. CONTRACTOR shall provide them proper and safe conditions for such access, and advise them of CONTRACTOR's site safety procedures and programs so that they may comply therewith as applicable.

13.3 Tests and Inspections:

13.3.1 All testing laboratories performing on the project shall meet the requirements of ASTM E-329**.**

13.3.2 OWNER's Responsibilities:

OWNER shall employ and pay for services of an independent testing laboratory to perform all inspections, tests, or approvals of materials purchased and installed per the Contract Documents (quality assurance) except as provided herein**.**

13.3.3 CONTRACTOR's Responsibilities:

.1 Contractor shall give timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

.2 Contractor shall be responsible for arranging and obtaining and shall pay for all costs in connection with any inspections, tests, or approvals required for Owner's and E/A's review of submittals covering materials, equipment, and mix designs to be incorporated into the Work.

.3 Contractor shall be responsible for costs associated with tests that report non-compliance, improperly timed testing activities (test not ready to be performed), or stand by time incurred by Owner's testing lab. Owner will deduct these costs from the Contractor's Pay Applications.

.4 Contractor shall be responsible for arranging, obtaining, and shall pay all costs in connection with their own quality control processes and procedures.

13.3.4 If laws or regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Owner's Representative with the required certificates of inspection or approval**.**

13.4 Uncovering Work:

13.4.1 If any Work (or the work of others) that is to be inspected, tested or approved is covered by CONTRACTOR without written concurrence of Owner's Representative, or if any Work is covered contrary to the written request of Owner's Representative, it must, if requested by Owner's Representative, be uncovered and recovered at CONTRACTOR's expense.

13.4.2 Uncovering Work as provided in paragraph 13.4.1 shall be at CONTRACTOR's expense unless CONTRACTOR has given Owner's Representative timely notice of CONTRACTOR's intention to cover the same and Owner's Representative has not acted within five (5) working days to such notice.

13.4.3 If Owner's Representative considers it necessary or advisable that covered Work be observed, inspected or tested, CONTRACTOR shall uncover, expose or otherwise make available for observation, inspection or testing that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, CONTRACTOR shall pay all claims, costs, losses and damages caused by, arising out of or resulting from such uncovering, exposure, observation, inspection and testing and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and OWNER shall be entitled to an appropriate decrease in the Contract Amount, and may make a Claim therefor as provided in Article 11. If, however, such Work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Amount or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement and reconstruction; and CONTRACTOR may make a Claim therefor as provided in Articles 11 and 12.

13.5 OWNER May Stop the Work:

13.5.1 If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers, suitable materials, and/or equipment; or fails to furnish or perform the Work in such a way that the Work in progress or the completed Work will conform to the Contract Documents, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR or any surety or other party.

13.5.2 If CONTRACTOR fails to correct defective Work or submit a satisfactory plan to take corrective action, with procedure and time schedule, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until cause for such order has been eliminated, or take any other action permitted by this Contract. A notice to stop the Work, based on defects, shall not stop calendar or working days charged to the Project.

13.6 Correction or Removal of Defective Work: If required by OWNER, CONTRACTOR shall promptly, as directed, either correct all defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by Owner's Representative, remove it from the site and replace it with Work that is not defective. CONTRACTOR shall correct or remove and replace defective Work, or submit a plan of action detailing how the deficiency will be corrected, within the time frame identified in the notice of defective Work. CONTRACTOR shall pay all claims, costs, losses and damages caused by or resulting from such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.7 Warranty period:

13.7.1 If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by laws or regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents (e.g. paragraph 14.11.2), any Work, including work performed after the Substantial Completion date, is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions:

(i) correct such defective Work, or, if it has been rejected by OWNER, remove it from the site and replace it with Work that is not defective, and

(ii) satisfactorily correct or remove and replace any damage to other Work or the work of others resulting therefrom.

If CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the defective Work corrected or the rejected Work removed and replaced, and all claims, costs, losses and damages caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR. The warranty period will be deemed to be renewed and recommenced in connection with the completed items of Work requiring correction.

13.7.2 In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the warranty period for that item may start to run from an earlier date if so provided in the Contract Documents.

13.7.3 If correction of defective Work will affect the function or use of the facility CONTRACTOR shall not proceed with correction of defective Work without prior coordination and approval of OWNER.

13.7.4 The obligations of the CONTRACTOR to perform warranty work will survive the acceptance of the Work and any termination of the Contract.

13.8 Acceptance of Defective Work: If, instead of requiring correction or removal and replacement of defective Work, OWNER decides to accept it, OWNER may do so. CONTRACTOR shall pay all claims, costs, losses and damages attributable to OWNER's evaluation of and determination to accept such defective Work. If any such acceptance occurs prior to recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents and compensating OWNER for the diminished value of the defective Work. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER after a calculation by OWNER of the diminution in value of the defective Work.

13.9 OWNER May Correct Defective Work: If CONTRACTOR fails within a reasonable time after Written Notice of OWNER to correct defective Work, or to remove and replace rejected Work, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, OWNER may, after seven (7) calendar days' Written Notice to CONTRACTOR, correct and remedy any such deficiency. If, in the opinion of the Owner's Representative, significant progress has not been made during this seven (7) calendar day period to correct the deficiency, the OWNER may exercise any actions necessary to remedy the deficiency. In exercising the rights and remedies under this paragraph, OWNER shall proceed expeditiously. In connection with such corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the site, take possession of all or part of the Work, and suspend CONTRACTOR's services related thereto, and incorporate in the Work all materials and equipment stored at the site or for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, its agents and employees, OWNER's other contractors, E/A and E/A's consultants access to the site to enable OWNER to exercise the rights and remedies under this paragraph. All claims, costs, losses and damages incurred or sustained by OWNER in exercising such rights and remedies will be charged against CONTRACTOR and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work. Such claims, costs, losses and damages will include but not be limited to all costs of repair or replacement of work of others destroyed or damaged by correction, removal or replacement of CONTRACTOR's defective Work. CONTRACTOR shall not be allowed an extension of the Contract Times (or

Milestones), or claims of damage because of any delay in the performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies hereunder.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.1 Application for Progress Payment:

14.1.1 Within 45 days from when the work was performed by the Contractor and Subcontractors, but not more often than once a month, CONTRACTOR shall submit to Owner's Representative for review an Application for Payment, in a form acceptable to OWNER, filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.

14.1.2 Such applications shall not include requests for payment on account of changes in the Work which have been properly authorized by Change Directives but not yet included in Change Orders.

14.1.3 Such applications shall not include requests for payment of amounts the CONTRACTOR does not intend to pay to a Subcontractor or Supplier because of a dispute or other reason.

14.1.4 If payment is requested on the basis of materials or equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall be accompanied by such bills of sale, data and other procedures satisfactory to OWNER substantiating OWNER's title to such materials or equipment or otherwise protecting OWNER's interest. Payment on account of such materials or equipment will not include any amount for CONTRACTOR's overhead or profit or relieve CONTRACTOR of its obligation to protect and install such materials or equipment in accordance with the requirements of the Contract and to restore damaged or defective Work. If materials or equipment are stored at another location, at the direction of the OWNER they shall be stored in a bonded and insured facility, accessible to E/A and OWNER, and shall be clearly marked as property of OWNER. Title to materials delivered to the site of the Work or a staging area will pass to OWNER upon payment by OWNER without the necessity for further documentation. Risk of loss will not pass to OWNER until acceptance.

14.1.5 Where the original Contract Amount is less than $400,000, OWNER will pay CONTRACTOR total amount of approved Application for Payment, less ten percent (10%) of amount thereof, which ten percent (10%) will be retained until final payment, less all previous payments and less all other sums that may be retained by OWNER under the terms of this Agreement. Where the original Contract Amount is $400,000 or more, OWNER will pay CONTRACTOR total amount of approved Application for Payment, less five percent (5%) of amount thereof, which five percent (5%) will be retained until final payment, less all previous payments and less all other sums that may be retained by OWNER under the terms of this Agreement. In either case, if the Work is near completion and delay occurs due to no fault or neglect of CONTRACTOR, OWNER may pay a portion of the retained amount to CONTRACTOR. CONTRACTOR, at OWNER's option, may be relieved of the obligation to complete the Work and, thereupon, CONTRACTOR shall receive payment of the balance due under the Contract subject to the conditions stated under paragraph 15.2. A Subcontractor may submit a written request to the CONTRACTOR and Project Manager requesting release of retainage for work by the

Subcontractor that has been completed and approved. The Project Manager will evaluate the request and if it is approved, the Project Manager will request the CONTRACTOR to include the request for release of an appropriate amount of retainage in the next Pay Application.

14.1.6 Applications for Payment shall include the following documentation:

.1 updated Progress Schedule;

.2 monthly subcontractor report;

.3 any other documentation required under the Supplemental General Conditions.

14.2 CONTRACTOR's Warranty of Title: CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER free and clear of all Liens no later than the time of payment to CONTRACTOR.

14.3 Review of Applications for Progress Payment:

14.3.1 Owner's Representative will, within seven (7) calendar days after receipt of each Application for Payment, either indicate a recommendation for payment and forward the Application for processing by OWNER, or return the Application to CONTRACTOR indicating Owner's Representative's reasons for refusing to recommend payment. In the latter case, CONTRACTOR shall make the necessary corrections and resubmit the Application.

14.3.2 Owner's Representative's recommendation of any payment requested in an Application for Payment will constitute a representation by Owner's Representative, based upon Owner's Representative's on-site observations of the executed Work and on Owner's Representative's review of the Application for Payment and the accompanying data and schedules, that to the best of Owner's Representative's knowledge, information and belief:

.1 the Work has progressed to the point indicated; and

.2 the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for unit price Work, and to any other qualifications stated in the recommendation).

14.3.3 By recommending any such payment, Owner's Representative will not thereby be deemed to have represented that:

.1 exhaustive or continuous on-site inspections have been made to check the quality or the quantity of the Work;

.2 examination has been made to ascertain how or for what purpose CONTRACTOR has used money previously paid on account of the Contract Amount;

.3 CONTRACTOR's construction means, methods, techniques, sequences or procedures have been reviewed; or

.4 that there may not be other matters or issues between the parties that might entitle CONTRACTOR to be paid additionally by OWNER or entitle OWNER to withhold payment to CONTRACTOR.

14.4 Decisions to Withhold Payment:

14.4.1 OWNER may withhold or nullify the whole or part of any payment to such extent as may be necessary on account of:

.1 defective Work not remedied;

.2 third party Claims filed or reasonable evidence indicating probable filing of such Claims;

.3 failure of CONTRACTOR to make payments properly to Subcontractors for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Amount;

.5 damage to OWNER or another 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;

.7 failure of CONTRACTOR to submit a schedule of values in accordance with the Contract Documents;

.8 failure of CONTRACTOR to submit a submittal schedule in accordance with the Contract Documents;

.9 failure of CONTRACTOR to submit and update a construction Progress Schedule in accordance with the Contract Documents;

.10 failure of CONTRACTOR to maintain a record of changes on drawings and documents;

.11 failure of CONTRACTOR to maintain weekly payroll reports and, as applicable, provide copies of reports in a timely manner upon request of OWNER;

.12 failure of CONTRACTOR to submit monthly subcontractor reports;

.13 CONTRACTOR's neglect or unsatisfactory prosecution of the Work, including failure to clean up;

.14 failure of CONTRACTOR to comply with the Austin City Code, Chapter 2-9-A, as amended, "Minority-Owned and Women-Owned Business Enterprise Procurement Program;" or

.15 failure of CONTRACTOR to comply with any provision of the Contract Documents.

14.4.2 When the above reasons for withholding payment are removed, CONTRACTOR shall resubmit a statement for the value of Work performed. Payment will be made within thirty (30) calendar days of receipt of approved Application for Payment.

14.4.3 Subcontractors may request Partial Payment when the OWNER withholds payment of an invoice to the CONTRACTOR for any reason listed in Section 14.4.1. If payment is withheld by the OWNER, the CONTRACTOR shall notify all affected Subcontractors within two (2) working days of notice that payment is being withheld. Upon notification, Subcontractors may submit a formal written request for Partial Payment to the CONTRACTOR and OWNER. If directed by the OWNER, the CONTRACTOR shall within three (3) working days resubmit to the OWNER an invoice for the same period that includes only the work performed by the requesting Subcontractors during this period. The OWNER will review this resubmitted invoice in accordance with Section 14.3.1. Upon receipt of payment

for the resubmitted invoice, CONTRACTOR shall pay the subcontractor within ten (10) Calendar Days in accordance with Section 6.4.7.

14.5 Delayed Payments: Should OWNER fail to make payment to CONTRACTOR of sum named in any Application for Payment within thirty (30) calendar days after the day on which OWNER received the mutually acceptable Application for Payment, then OWNER will pay to CONTRACTOR, in addition to sum shown as due by such Application for Payment, interest thereon at the rate specified in Government Code, Section 2251.025(b) from date due until fully paid, which shall fully liquidate any injury to CONTRACTOR growing out of such delay in payment.

14.6 Arrears: No money shall be paid by OWNER upon any claim, debt, demand or account whatsoever, to any person, firm or corporation who is in arrears to City for taxes; and City shall be entitled to counterclaim and automatically offset against any such debt, claim, demand or account in the amount of taxes so in arrears and no assignment or transfer of such debt, claim, demand or account after said taxes are due, shall affect the right of OWNER to so offset said taxes, and associated penalties and interest if applicable, against the same.

14.7 Substantial Completion:

14.7.1 When the CONTRACTOR considers that the Work, or a portion thereof which the OWNER agrees to accept separately, is substantially complete, the CONTRACTOR shall notify Owner's Representative and request a determination as to whether the Work or designated portion thereof is substantially complete. If Owner's Representative does not consider the Work substantially complete, Owner's Representative will notify CONTRACTOR giving reasons therefor. After performing any required Work, CONTRACTOR shall then submit another request for Owner's Representative to determine Substantial Completion. If Owner's Representative considers the Work substantially complete, Owner's Representative will prepare and deliver a certificate of Substantial Completion which shall establish the date of Substantial Completion, shall include a punch list of items to be completed or corrected before final payment, shall establish the time within which CONTRACTOR shall finish the punch list, and shall establish responsibilities of the OWNER and CONTRACTOR for security, maintenance, heat, utilities, damage to the Work, warranty and insurance. Failure to include an item on the punch list does not alter the responsibility of CONTRACTOR to complete all Work in accordance with the Contract Documents. If a Certificate of Occupancy is required by public authorities having jurisdiction over the Work, said certificate shall be issued before the Work or any portion thereof is considered substantially complete. The certificate of Substantial Completion shall be signed by OWNER and CONTRACTOR to evidence acceptance of the responsibilities assigned to them in such certificate.

14.7.2 OWNER shall have the right to exclude CONTRACTOR from the Work after the date of Substantial Completion, but OWNER will allow CONTRACTOR reasonable access to complete or correct items on the punch list and complete warranty work.

14.8 Partial Utilization: Use by OWNER, at OWNER's option, of any substantially completed part of the Work which: (i) has specifically been identified in the Contract Documents, or (ii) OWNER and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by OWNER for its intended purpose without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work in accordance with the following:

14.8.1 OWNER at any time may request CONTRACTOR to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and

substantially complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR shall certify to Owner's Representative that such part of the Work is substantially complete and request Owner's Representative to issue a certificate of substantial Completion for that part of the Work. CONTRACTOR at any time may notify Owner's Representative that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request Owner's Representative to issue a certificate of Substantial Completion for that part of the Work. The provisions of paragraphs 14.7.1 and 14.7.2 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

14.8.2 Such partial utilization is authorized by public authorities having jurisdiction over the Work.

14.9 Final Inspection: Upon Written Notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete, Owner's Representative will make a final inspection with CONTRACTOR and provide Written Notice of all particulars in which this inspection reveals that the Work is incomplete or defective. CONTRACTOR shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.10 Final Application for Payment: CONTRACTOR may make application for final payment following the procedure for progress payments after CONTRACTOR has completed all such corrections to the satisfaction of Owner's Representative and delivered the following documents:

14.10.1 Affidavit by CONTRACTOR certifying the payment of all debts and claims;

14.10.2 Three (3) complete operating and maintenance manuals, each containing maintenance and operating instructions, schedules, guarantees, and other documentation required by the Contract Documents;

14.10.3 Record documents (as provided in paragraph 6.10);

14.10.4 Consent of surety, if any, to final payment. If surety is not provided, complete and legally effective releases or waivers (satisfactory to OWNER) of all claims arising out of or filed in connection with the Work;

14.10.5 Certificate evidencing that insurance required by the Supplemental General Conditions will remain in force after final payment and through the warranty period;

14.10.6 Non-Use of Asbestos Affidavit (After Construction);

14.10.7 Subcontractor report and all other documentation necessary for evaluation of CONTRACTOR’s fulfillment of the Contract MBE/WBE or DBE goals;

14.10.8 Documentation of notice to claimants, to the extent applicable and subject to subparagraph 14.11.4;

14.10.9 Proof of performance Bond extension through warranty period, if a performance Bond was required; and

14.10.10 Any other documentation called for in the Contract Documents.

14.11 Final Payment and Acceptance:

14.11.1 If, on the basis of observation of the Work during construction, final inspection, and review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Owner's Representative is satisfied that

the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled and there are no outstanding claims, Owner's Representative will recommend the final Application for Payment and thereby notify the OWNER, who will pay to CONTRACTOR the balance due CONTRACTOR under the terms of the Contract.

14.11.2 If the Contract measures Contract Time to Final Completion, rather than Substantial Completion, Owner's Representative will issue a letter of final acceptance to CONTRACTOR which establishes the Final Completion date and initiates the one-year warranty period. If the sole remaining unfinished item to complete the Work is the reestablishment of vegetation and CONTRACTOR has executed a revegetation letter with fiscal posted (letter of credit) to ensure completion of this item, the Owner's Representative will issue a letter of conditional acceptance to CONTRACTOR which established the Final Completion date and initiates the one-year warranty period.

14.11.3 Final payment is considered to have taken place when CONTRACTOR or any of its representatives negotiates OWNER's final payment check, whether labeled final or not, for cash or deposits check in any financial institution for its monetary return.

14.11.4 The OWNER will withhold funds sufficient to cover the amount of any unresolved contract claims from final payment for six months under the following limited conditions:

.1 CONTRACTOR must provide written notice to the claimant (via certified mail or hand delivery) that (i) OWNER will hold funds in the amount of the disputed claim for six (6) months from the date of the receipt of the notice and (ii) CONTRACTOR and the claimant have certain alternative dispute resolution rights; and

.2 CONTRACTOR must provide OWNER with a copy of the receipted notice.

Provided the claimant has received notice under this section, OWNER will release the withheld funds, if the CONTRACTOR provides a bond in substantial compliance with the provisions of Section 52.231 of the Texas Property Code; when the OWNER receives a settlement or release of the claim with accompanying instructions regarding payment; upon resolution of the claim in litigation, if suit is filed within such six (6) month period and the OWNER receives written notice of such filing; or when such six (6) month period has passed, if no such bond, settlement, release, or notice of filing of suit have been received. The above provisions notwithstanding, if efforts to timely resolve a disputed claim are not being made to OWNER'S reasonable satisfaction, OWNER may, in its complete discretion, file an interpleader action and deposit the withheld funds in the registry of a court of competent jurisdiction. In addition, CONTRACTOR must include a provision in each of its subcontracts that the prevailing party in any litigation arising thereunder will be entitled to recover its costs of court and reasonable attorney's fees.

14.12 Waiver of Claims: The making and acceptance of final payment will constitute:

14.12.1 a waiver of claims by OWNER against CONTRACTOR, except claims arising from unsettled claims, from defective Work appearing after final inspection, from failure to comply with the Contract Documents or the terms of any warranty specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

14.12.2 a waiver of all claims by CONTRACTOR against OWNER other than those previously made in writing and still unsettled.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.1 OWNER May Suspend Work Without Cause: At any time and without cause, OWNER may suspend the Work or any portion thereof for a period of not more than ninety (90) calendar days by Written Notice to CONTRACTOR which will fix the date on which the Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR shall be allowed an adjustment in the Contract Amount or an extension of the Contract Times, or both, directly attributable to any such suspension if CONTRACTOR makes an approved Claim therefor as provided in Articles 11 and 12.

15.2 OWNER May Terminate Without Cause: Upon seven (7) calendar days' Written Notice to CONTRACTOR, OWNER may, without cause and without prejudice to any right or remedy of OWNER, elect to terminate the Agreement. In such case, CONTRACTOR shall be paid (without duplication of any items):

15.2.1 for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination;

15.2.2 for reasonable demobilization costs; and

15.2.3 for anticipated profits on completed and accepted Work not previously paid and not included in separate pay items calculated to date of termination but not for anticipated profit on the entire Contract not previously paid, unabsorbed overhead, or lost opportunity.

15.3 OWNER May Terminate With Cause:

15.3.1 Upon the occurrence of any one or more of the following events:

.1 if CONTRACTOR persistently fails to perform the Work in accordance with the Contract Documents;

.2 if CONTRACTOR disregards laws or regulations of any public body having jurisdiction;

.3 if CONTRACTOR disregards the authority of Owner's Representative;

.4 if CONTRACTOR makes fraudulent statements;

.5 if CONTRACTOR fails to maintain a work force adequate to accomplish the Work within the Contract Time;

.6 if CONTRACTOR fails to make adequate progress and endangers successful completion of the Contract; or

.7 if CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents;

OWNER may, after giving CONTRACTOR (and the surety, if any) seven (7) calendar days Written Notice terminate the services of CONTRACTOR. OWNER, at its option, may proceed with negotiation with surety for completion of the Work. Alternatively, OWNER may under these circumstances exclude CONTRACTOR from the site and take possession of the Work (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the site or for which OWNER has paid CONTRACTOR but which are stored elsewhere, and finish the Work as OWNER may deem expedient. In such case

CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Amount exceeds all claims, costs, losses and damages sustained by OWNER arising out of or resulting from completing the Work, such excess will be paid to CONTRACTOR. If such claims, costs, losses and damage exceed such unpaid balance, CONTRACTOR or surety shall pay the difference to OWNER. In the event that a termination for cause is found to be wrongful, the termination shall be converted to a termination without cause as set forth in Section 15.2 and CONTRACTOR'S remedy for wrongful termination is limited to the recovery of the payments permitted for termination without cause as set forth in Section 15.2.

15.3.2 Where CONTRACTOR's services have been so terminated by OWNER, the termination will not affect any rights or remedies of OWNER against CONTRACTOR and surety then existing or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by OWNER will not release CONTRACTOR from liability. In the event OWNER terminates Contract with cause, OWNER may reject any and all Bids submitted by CONTRACTOR for up to three (3) years after the date of such termination. These sanctions will be administered in accordance with the City of Austin Purchasing Office Probation, Suspension, and Debarment Procedures for Vendors, which include notice and an opportunity for a hearing.

15.4 CONTRACTOR May Stop Work or Terminate: If through no act or fault of CONTRACTOR, the Work is suspended for a period of more than ninety (90) calendar days by OWNER or under an order of court or other public authority, or (except during disputes) Owner's Representative fails to forward for processing any mutually acceptable Application for Payment within thirty (30) calendar days after it is submitted, or (except during disputes) OWNER fails for sixty (60) calendar days after it is submitted to pay CONTRACTOR any sum finally determined by OWNER to be due, then CONTRACTOR may, upon seven (7) calendar days' Written Notice to OWNER, and provided OWNER does not remedy such suspension or failure within that time, terminate the Agreement and recover from OWNER payment on the same terms as provided in paragraph 15.2. In lieu of terminating the Agreement and without prejudice to any other right or remedy, if (except during disputes) Owner's Representative has failed to forward for processing any mutually acceptable Application for Payment within thirty (30) calendar days after it is submitted, or (except during disputes) OWNER has failed for sixty (60) calendar days after it is submitted to pay CONTRACTOR any sum finally determined by OWNER to be due, CONTRACTOR may upon seven (7) calendar days' Written Notice to OWNER stop the Work until payment of all such amounts due CONTRACTOR, including interest thereon. The provisions of this paragraph 15.4 are not intended to preclude CONTRACTOR from making a Claim under Articles 11 and 12 for an increase in Contract Amount or Contract Times or otherwise for expenses or damage directly attributable to CONTRACTOR's stopping Work as permitted by this paragraph.

15.5 Discretionary Notice to Cure: In its complete discretion, OWNER may, but is not required to, provide a Notice to Cure to CONTRACTOR and its surety to cure an event of default described above and/or an anticipatory breach of contract and, if required by OWNER, to attend a meeting with OWNER, regarding the Notice to Cure, the event of default, and/or the anticipatory breach of contract. The Notice to Cure will set forth the time limit in which the cure is to be completed or commenced and diligently prosecuted. Upon receipt of any Notice to Cure, CONTRACTOR shall prepare a report describing its program and measures to affect the cure of the event of default and/or anticipatory breach of contract within the time required by the Notice to Cure. The CONTRACTOR'S report must be delivered to OWNER at least three (3) days prior to any requested meeting with the OWNER and surety.

15.6 Bankruptcy: If CONTRACTOR declares bankruptcy or is adjudged bankrupt or makes an assignment for the benefit of creditors or if a receiver is appointed for the benefit of

creditors or if a receiver is appointed by reason of CONTRACTOR'S insolvency, CONTRACTOR may be unable to perform this Contract in accordance with the Contract requirements. In such an event, OWNER may demand CONTRACTOR or its successor in interest provide OWNER with adequate assurance of CONTRACTOR'S future performance in accordance with the terms and conditions of the Contract. If CONTRACTOR fails to provide adequate assurance of future performance to OWNER'S reasonable satisfaction within ten (10) days of such a request, OWNER may terminate the CONTRACTOR'S services for cause or without cause, as set forth above. If CONTRACTOR fails to provide timely adequate assurance of its performance and actual performance, OWNER may prosecute the Work with its own forces or with other contractors on a time and material or other appropriate basis and the cost of which will be charged against the Contract balance.

15.7 Duty to Mitigate: In the event of any termination or suspension under this Contract, the CONTRACTOR agrees to and shall take all reasonable actions to mitigate its damages and any and all claims which may be asserted against the OWNER.

15.8 Responsibility during Demobilization: While demobilizing, the CONTRACTOR will take all necessary and reasonable actions to preserve and protect the Work, the site and other property of the OWNER or others at the site.

ARTICLE 16 - DISPUTE RESOLUTION

16.1 Filing of Claims:

16.1.1 Claims arising from the circumstances identified in paragraphs 3.2, 4.1, 4.2.2, 4.2.4, 6.4.2, 6.11.5.2, 6.17, 7.5, 8.6, 9.5, 10.4.2, 13.4.3, 13.8, 13.9, 15.1, 15.2, 15.3, or 15.4, or other occurrences or events, shall be made by Written Notice delivered by the party making the Claim to the other party within thirty (30) calendar days after the start of the occurrence or event giving rise to the Claim and stating the general nature of the Claim. Notice of the amount of the Claim with supporting data shall be delivered in writing within thirty (30) calendar days after Written Notice of Claim is delivered by claimant and shall represent that the adjustment claimed covers all known amounts and/or extensions of time to which claimant is entitled.

16.1.2 Within thirty (30) calendar days of receipt of notice of the amount of the Claim with supporting data, Owner's Representative and CONTRACTOR shall meet to discuss the Claim, after which an offer of settlement or notification of no settlement offer will be made to claimant. If claimant is not satisfied with the proposal presented, claimant shall have thirty (30) calendar days in which to: (i) submit additional supporting data requested by the other party; (ii) modify the initial Claim; or (iii) request Alternative Dispute Resolution.

16.2 Alternative Dispute Resolution:

16.2.1 If a dispute exists concerning a Claim, the parties agree to use the following procedure prior to pursuing any other available remedies. OWNER reserves the right to include the E/A as a party.

16.2.2 Negotiating with Previously Uninvolved Personnel: Either party may make a written request for a meeting to be held between representatives of each party within fourteen (14) Calendar Days of the request or such later period that the parties may agree to. Each party shall endeavor to include, at a minimum, one (1) previously uninvolved senior level decision maker (an owner, officer, or employee of each organization) empowered to negotiate on behalf of their

organization. If a previously uninvolved senior level decision maker is unavailable due to the size of the CONTRACTOR'S organization or any other reason, the CONTRACTOR shall nonetheless provide an appropriate senior level decision maker for the meeting. The purpose of this and any subsequent meetings will be good faith negotiations of the matters constituting the dispute. Negotiations shall be concluded within thirty (30) Calendar Days of the first meeting, unless mutually agreed otherwise. This step may be waived by a written agreement signed by both parties, in which event the parties may proceed directly to mediation as described below.

16.2.3 Mediation:

.1 If the procedure described in 16.2.2 proves unsuccessful or is waived pursuant to its terms, the parties shall initiate the mediation process. OWNER and CONTRACTOR agree to select within thirty (30) calendar days a mediator trained in mediation skills, to assist with resolution of the dispute. OWNER and CONTRACTOR agree to act in good faith in the selection of the mediator and to give consideration to qualified individuals nominated to act as mediator. Nothing in this agreement prevents the parties from relying on the skills of a person who also is trained in the subject matter of the dispute and/or a contract interpretation expert. Should the parties fail to agree on a mediator within thirty (30) calendar days of initiation of the mediation process, the parties agree to ask the Travis County Dispute Resolution Center to select a qualified individual, which selection shall be binding on the parties.

.2 Mediation is a forum in which an impartial person, the mediator, facilitates communication between parties to promote reconciliation, settlement, or understanding among them. The parties hereby agree that mediation, at a minimum, shall provide for (i) conducting an on-site investigation, if appropriate, by the mediator for fact gathering purposes, (ii) a meeting of all parties for the exchange of points of view and (iii) separate meetings between the mediator and each party to the dispute for the formulation of resolution alternatives. The parties agree to participate in mediation in good faith for up to thirty (30) calendar days from the date of the first mediation session, unless mutually agreed otherwise. Should the parties fail to reach a resolution of the dispute through mediation, then each party is released to pursue other remedies available to them.

16.3 Resolution of Disputes between Contractor and Subcontractor or Supplier: If a dispute exists concerning a claim between a CONTRACTOR and a Subcontractor or Supplier, the CONTRACTOR agrees to participate with such Subcontractor and/or Supplier in a process substantially paralleling the steps set out in paragraphs 16.1 and 16.2 above, including the delivery of written notices, submission of supporting data, negotiation with previously uninvolved personnel, and, if such alternative dispute resolution process is unsuccessful, mediation between the parties to the claim. If the CONTRACTOR and Subcontractor or Supplier agreement provides an alternative dispute resolution process, which provides substantially equivalent rights to those set forth herein, it may be followed, unless the CONTRACTOR and affected Subcontractor or Supplier agree to follow the process outlined above. The OWNER is not a party to the alternative dispute resolution process between the CONTRACTOR and Subcontractor or Supplier and will not pay any costs incurred in the process. Each party will be responsible for its own expenses incurred in the process, which will include an equal share of the mediation expenses, unless otherwise determined by the mediator. NOTICE: THE PROCESS SET FORTH HEREIN IS NOT A SUBSTITUTE FOR THE STATUTORY PAYMENT BOND CLAIM PROCESS.

16.4 Claim Calculation:

16.4.1 Delay Claims: The intent of paying for delay damages is to reimburse the CONTRACTOR for actual expense arising out of a compensable delay. No profit or force account markups, other than labor burden, will be allowed for delay claims by the CONTRACTOR seeking reimbursement for expenses arising out of an alleged event of delay. No consequential damages will be allowed to the CONTRACTOR in connection with any claimed delays. If the CONTRACTOR requests compensation for delay damages and the delay is determined to be compensable, then standby equipment costs and project overhead compensation will be based on the duration of the compensable delay and the following:

.1 Standby equipment costs will not be allowed during periods when the equipment would have otherwise been idle. Standby equipment time will not exceed more than eight (8) hours per twenty-four (24) hour day, forty (40) hours per week, and one hundred seventy-six (176) hours per month. Standby equipment costs will be paid at 50 percent (50%) of the applicable Rental Rate Blue Book rates and calculated by dividing the monthly rate by one hundred seventy-six (176), multiplying the result by the number of standby hours and multiplying that number by the regional adjustment factor and the rate adjustment factor contained in the Blue Book. Operating costs will not be allowed.

.2 Project overhead will be determined from actual costs that the CONTRACTOR will be required to document. Project overhead is defined as the administrative and supervisory expenses incurred at the work site and will not include home office overhead.

16.4.2 General: Except as limited with respect to delay claims, as set forth above, the criteria set forth in Section 11.4.1 may be used as a basis to calculate an adjustment in the Contract Amount in the resolution of a claim, provided that there will be no compensation for home office overhead.

16.5 MBE/WBE Program Progressive Sanctions: CONTRACTOR is subject to progressive sanctions for failure of CONTRACTOR to comply with Austin City Code, Chapter 2-9A, as amended: "Minority-owned and Women-owned Business Enterprise Procurement Program." Available sanctions for Program violations are set forth in Program rules adopted by the Small and Minority Business Resources Department (SMBR), as amended, and may include the following progressive sanctions for Program violations within a rolling 24-month period: (i) a period of probation for up to six (6) months for the first violation (ii) a period of suspension from bidding for up to 24 months for the second violation, and (iii) a period of debarment for up to five (5) years for the third violation. If the CONTRACTOR engages in more than one of the violations listed below at any given time, OWNER has the discretion to determine whether such actions should be counted as multiple violations of the MBE/WBE Ordinance. Program violations include:

.1 providing false or misleading information to the OWNER in connection with the submission of a Bid, responses to request for qualifications or Proposals, Good Faith Efforts documentation, post award compliance or other Program operations;

.2 substituting M/WBE Subcontractors without first receiving approval for such substitutions;

.3 failure to comply with the approved Compliance Plan without an approved request for a change, an approved Change Order or other approved change to the Contract;

.4 violation of any other provision of the "Minority-owned and Women-owned Business Enterprise Procurement Program";

.5 providing false or misleading information to the OWNER in connection with an application for or challenge to certification, recertification or decertification as a MBE/WBE; and

.6 bid shopping.

The Progressive Sanctions will be administered in accordance with the City of Austin Purchasing Office Probation, Suspension, and Debarment Procedures for Vendors, which includes notice and an opportunity for a hearing.

ARTICLE 17 – MISCELLANEOUS

17.1 Venue: In the event of any suit at law or in equity involving the Contract, venue shall be exclusively in Travis County, Texas and the laws of the State of Texas shall apply to the interpretation and enforcement of the Contract.

17.2 Extent of Agreement: This Contract represents the entire and integrated agreement between the OWNER and CONTRACTOR with respect to the subject matter hereof and supersedes all prior negotiations, representations or agreements, either written or oral.

17.3 Cumulative Remedies: The rights and remedies available to the parties are not to be construed in any way as a limitation of any rights and remedies available to any or all of them which are otherwise imposed or available by laws or regulations, by special warranty or guarantees or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply. Specifically, the OWNER is not required to only assess liquidated damages, and OWNER may elect to pursue its actual damages resulting from the failure of the CONTRACTOR to complete the Work in accordance with the requirements of the Contract Documents.

17.4 Severability: If any word, phrase, clause, sentence or provision of the Contract, or the application of same to any person or set of circumstances is for any reason held to be unconstitutional, invalid or unenforceable, that finding shall only effect such word, phrase, clause, sentence or provision, and such finding shall not affect the remaining portions of this Contract; this being the intent of the parties in entering into the Contract; and all provisions of the Contract are declared to be severable for this purpose.

17.5 Independent Contractor: The Contract shall not be construed as creating an employer/employee relationship, a partnership, or a joint venture. CONTRACTOR is an independent contractor and CONTRACTOR's services shall be those of an independent contractor. CONTRACTOR agrees and understands that the Contract does not grant any rights or privileges established for employees of OWNER.

17.6 Prohibition of Gratuities: OWNER may, by Written Notice to CONTRACTOR, terminate the Contract without liability if is determined by OWNER that gratuities were offered or given by CONTRACTOR or any agent or representative of CONTRACTOR to any officer or employee of OWNER with a view toward securing the Contract or securing favorable treatment with respect to the awarding or amending or the making of any determinations

with respect to the performing of such Contract. In the event the Contract is terminated by OWNER pursuant to this provision, OWNER shall be entitled, in addition to any other rights and remedies, to recover or withhold the amount of the cost incurred by CONTRACTOR in providing such gratuities.

17.7 Prohibition Against Personal Interest in Contracts: No officer, employee, independent consultant, or elected official of OWNER who is involved in the development, evaluation, or decision-making process of the performance of any solicitation shall have a financial interest, direct or indirect, in the Contract resulting from that solicitation. Any violation of this provision, with the knowledge, expressed or implied, of CONTRACTOR shall render the Contract voidable by OWNER.

17.8 OWNER'S Right to Audit:

17.8.1 Records means all records generated by or on behalf of CONTRACTOR and each Subcontractor and Supplier of CONTRACTOR, whether paper, electronic, or other media, which are in any way related to performance of or compliance with this Contract, including, without limitation:

.1 accounting records;

.2 written policies and procedures;

.3 subcontract files (including proposals of successful and unsuccessful Bidders, Bid recaps, etc.);

.4 original estimates and estimating work sheets;

.5 correspondence;

.6 Change Order files (including documentation covering negotiated settlements);

.7 back charge logs and supporting documentation;

.8 general ledger entries detailing cash and trade discounts earned, insurance rebates and dividends;

.9 lump sum agreements between CONTRACTOR and any Subcontractor or Supplier;

.10 records necessary to evaluate: Contract compliance, Change Order pricing, and any Claim submitted by CONTRACTOR or any of its payees; and

.11 any other CONTRACTOR record that may substantiate any charge related to this Contract.

17.8.2 CONTRACTOR shall allow OWNER'S agent or its authorized representative to inspect, audit, and/or reproduce, or all three, all Records generated by or on behalf of CONTRACTOR and each Subcontractor and Supplier, upon OWNER'S written request. Further, CONTRACTOR shall allow OWNER'S agent or authorized representative to interview any of CONTRACTOR'S employees, all Subcontractors and all Suppliers, and all their respective employees.

17.8.3 CONTRACTOR shall retain all its Records, and require all its Subcontractors and Suppliers to retain their respective Records, during this Contract and for three (3) years after final payment, until all audit and litigation matters that OWNER has brought to the attention of CONTRACTOR are resolved, or as otherwise required by law, whichever is longer. OWNER'S right to inspect, audit, or reproduce Records, or interview employees of CONTRACTOR or its respective Subcontractors or Suppliers exists during this Contract, and for three (3) years after final payment,

until all audit and litigation matters that OWNER has brought to CONTRACTOR'S attention are resolved, or as otherwise required by law, whichever is longer, and at no cost to OWNER, either from CONTRACTOR or any of its Subcontractors or Suppliers that may furnish Records or make employees available for interviewing.

17.8.4 CONTRACTOR must provide sufficient and accessible facilities during its normal business hours for OWNER to inspect, audit, or reproduce Records, or all three, and to interview any person about the Records.

17.8.5 CONTRACTOR shall insert these requirements in each written contract between CONTRACTOR and any Subcontractor or Supplier and require each Subcontractor and Supplier to comply with these provisions.

17.9 Survival: The terms and conditions of this Contract, which contemplate a period of time beyond completion or termination will survive such completion or termination and not be merged therein or otherwise terminated.

17.10 No Waiver: The waiver of any provision of this Contract will not be deemed to be a waiver of any other provision of this Contract. No waiver of any provision of this Contract will be deemed to constitute a continuing waiver unless expressly provided in writing, nor will a waiver of any default be deemed a waiver of any subsequent defaults of the same type. The failure at any time to enforce this Contract, whether the default is known or not, shall not constitute a waiver or estoppel of the right to do so.

17.11 Conditions Precedent to Right to Sue: Notwithstanding anything herein to the contrary, the CONTRACTOR will have at least 90 days to give notice of a claim for damages as a condition precedent to the right to sue on the Contract, subject to the contractual claim and alternative dispute resolution processes set forth herein.

17.12 Waiver of Trial by Jury: OWNER and CONTRACTOR agree that they have knowingly waived the right to trial by jury and have instead agreed that, in the event of any litigation arising out of or connected to this Contract, to proceed with a trial before the court, unless both parties subsequently agree otherwise in writing.

17.13 Contractor Evaluation: The Owner will review and evaluate the Contractor's Work and performance on the Project and provide the Contractor with a written Contractor Evaluation Report in accordance with City of Austin Administrative Rule R161-13.37. Rule R161-13.37 provides an appeal process. https://www.austintexas.gov/department/cpe-program

End

SUPPLEMENTAL GENERAL CONDITIONS
Section 00810

The Supplemental General Conditions contained herein amend or supplement the General Conditions, Section 00700.

ARTICLE 1 – DEFINITIONS

Add to the following definition:

1.20 Engineer/Architect (E/A): The OWNER's design professional for this contract is:

Name: Jonathan Chen, P.E., AECOM Technical Services, Inc.
Address: 13640 Briarwick Drive, Suite 200, Austin, TX 78729

Delete 1.48 and 1.49 and replace with the following (changes to the original text are identified by underlining):

1.48 Working Day - Any day of the week, not including Fridays, Saturdays, Sundays, or Legal Holidays in which conditions under the CONTRACTOR's control will permit work for a continuous period of not less than seven (7) hours between 6:00 a.m. and 4:00 p.m. If other contract documents reduce the continuous period available for work to less than seven (7) hours, those reduced hours shall be considered a Working Day. Upon agreement with Owner's Representative, work on Fridays, Saturdays, Sundays, and/or Legal Holidays may be allowed and will be considered a Working Day.

1.49 Working Hours

.1 Working Day Contract: All Work shall be done between 6:00 a.m. and 4:00 p.m. unless otherwise authorized by Owner's Representative. However, emergency work may be done without prior permission as indicated in paragraph 6.11.5. If night Work is authorized and conditions under CONTRACTOR's control will permit Work for a continuous period of not less than seven (7) hours between 12:00 a.m. and 11:59 p.m. it will be considered a Working Day. Night Work may be revoked at any time by OWNER if CONTRACTOR fails to maintain adequate equipment and supervision for the prosecution and control of the night Work.

.2 Calendar Day Contract: All Work shall be done between 6:00 a.m. and 4:00 p.m. unless authorized by Owner's Representative. However, emergency work may be done without prior permission as indicated in paragraph 6.11.5. Night Work may be revoked at any time by OWNER if CONTRACTOR fails to maintain adequate equipment and supervision for the prosecution and control of the night Work.

ARTICLE 2 - PRELIMINARY MATTERS

2.4 Before Starting Construction:

Delete 2.4.2.6 and replace with the following (changes to the original text are identified by underlining):

.6 A preliminary schedule of values for all of the Work, subdivided into component parts in sufficient detail to serve as the basis for progress payments during construction. At a minimum, the schedule of values must be broken out by trade and split between materials

and labor. Prices will be deemed to include an appropriate amount of overhead and profit applicable to each item of Work;

ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

4.1 Availability of Lands: *Add the following to the end of the paragraph*:

CONTRACTOR shall contact OWNER's Transportation Department to obtain a Temporary Use of Right-of-Way Permit prior to beginning construction on any sidewalk/driveway or occupying any parking area/meters within the public right-of-ways.

ARTICLE 5 - BONDS AND INSURANCE

5.3 Other Bond and Insurance Requirements:

5.3.1 CONTRACTOR Provided Insurance

5.3.1.1 General Requirements.

.1 CONTRACTOR shall carry insurance in the types and amounts indicated below for the duration of the Contract, which shall include items owned by OWNER in the care, custody and control of CONTRACTOR prior to and during construction and warranty period.

.2 CONTRACTOR must complete and forward the Certificate of Insurance, Section 00650, to OWNER before the Contract is executed as verification of coverage required below. CONTRACTOR shall not commence Work until the required insurance is obtained and until such insurance has been reviewed by OWNER. Approval of insurance by OWNER shall not relieve or decrease the liability of CONTRACTOR hereunder and shall not be construed to be a limitation of liability on the part of CONTRACTOR. CONTRACTOR must also complete and forward the Certificate of Insurance, Section 00650, to OWNER whenever a previously identified policy period has expired as verification of continuing coverage.

.3 CONTRACTOR's insurance coverage is to be written by companies authorized to do business in the State of Texas at the time the policies are issued and shall be written by companies with A.M. Best ratings of B+VII or better, except for hazardous material insurance which shall be written by companies with A.M. Best ratings of A- or better.

.4 All endorsements naming the OWNER as additional insured, waivers, and notices of cancellation endorsements as well as the Certificate of Insurance shall indicate: City of Austin, Capital Contracting Office, P.O. Box 1088, Austin, Texas 78767.

.5 The "other" insurance clause shall not apply to the OWNER where the OWNER is an additional insured shown on any policy. It is intended that policies required in the Contract, covering both OWNER and CONTRACTOR, shall be considered primary coverage as applicable.

.6 If insurance policies are not written for amounts specified below, CONTRACTOR shall carry Umbrella or Excess Liability Insurance for any differences in amounts specified. If Excess Liability Insurance is provided, it shall follow the form of the primary coverage.

.7 OWNER shall be entitled, upon request and without expense, to receive certified copies of policies and endorsements thereto and may make any reasonable requests for deletion or revision or modification of particular policy terms, conditions, limitations, or exclusions except where policy provisions are established by law or regulations binding upon either of the parties hereto or the underwriter on any such policies.

.8 OWNER reserves the right to review the insurance requirements set forth during the effective period of this Contract and to make reasonable adjustments to insurance coverage, limits, and exclusions when deemed necessary and prudent by OWNER based upon changes in statutory law, court decisions, the claims history of the industry or financial condition of the insurance company as well as CONTRACTOR.

.9 CONTRACTOR shall not cause any insurance to be canceled nor permit any insurance to lapse during the term of the Contract or as required in the Contract.

.10 CONTRACTOR shall be responsible for premiums, deductibles and self-insured retentions, if any, stated in policies. All deductibles or self-insured retentions shall be disclosed on the Certificate of Insurance.

.11 CONTRACTOR shall provide OWNER thirty (30) days written notice of erosion of the aggregate limits below occurrence limits for all applicable coverages indicated within the Contract.

.12 If OWNER owned property is being transported or stored off-site by CONTRACTOR, then the appropriate property policy will be endorsed for transit and storage in an amount sufficient to protect OWNER's property.

.13 The insurance coverages required under this contract are required minimums and are not intended to limit the responsibility or liability of CONTRACTOR.

5.3.1.2 Business Automobile Liability Insurance. Provide coverage for all owned, non-owned and hired vehicles. The policy shall contain the following endorsements in favor of OWNER:

a) Waiver of Subrogation endorsement CA 0444;
b) 30 day Notice of Cancellation endorsement CA 0244; and
c) Additional Insured endorsement CA 2048.

Provide coverage in the following types and amounts:

.1 A minimum combined single limit of $500,000 per occurrence for bodily injury and property damage. Alternate acceptable limits are $250,000 bodily injury per person, $500,000 bodily injury per occurrence and at least $100,000 property damage liability each accident.

5.3.1.3 Workers' Compensation And Employers' Liability Insurance. Coverage shall be consistent with statutory benefits outlined in the Texas Workers' Compensation Act (Section 401). CONTRACTOR shall assure compliance with this Statute by submitting two (2) copies of a standard certificate of coverage (e.g. ACCORD form) to Owner's Representative for every person providing services on the Project as acceptable proof of coverage. The Certificate of Insurance, Section 00650, must be presented as evidence of coverage for CONTRACTOR. CONTRACTOR's policy shall apply to the State of Texas and include these endorsements in favor of OWNER:

a) Waiver of Subrogation, form WC 420304; and
b) 30 day Notice of Cancellation, form WC 420601.

The minimum policy limits for Employers' Liability Insurance coverage shall be as follows:

.1 $100,000 bodily injury per accident, $500,000 bodily injury by disease policy limit and $100,000 bodily injury by disease each employee.

5.3.1.4 Commercial General Liability Insurance. The Policy shall contain the following provisions:

a) Contractual liability coverage for liability assumed under the Contract and all contracts relative to this Project.
b) Completed Operations/Products Liability for the duration of the warranty period.
c) Explosion, Collapse and Underground (X, C & U) coverage.
d) Independent Contractors coverage (Contractors/ Subcontractors work).
e) Aggregate limits of insurance per project, endorsement CG 2503.
f) OWNER listed as an additional insured, endorsements CG 2010 and CG 2037 or equivalent.
g) 30 day notice of cancellation in favor of OWNER, endorsement CG 0205.
h) Waiver of Transfer of Recovery Against Others in favor of OWNER, endorsement CG 2404.

Provide coverages A&B with minimum limits as follows:

.1 A combined bodily injury and property damage limit of $500,000 per occurrence.

5.3.1.5 Builders' Risk Insurance. CONTRACTOR shall maintain Builders' Risk Insurance or Installation Insurance on an all risk physical loss form in the Contract Amount. Coverage shall continue until the Work is accepted by OWNER. OWNER shall be a loss payee on the policy. If off-site storage is permitted, coverage shall include transit and storage in an amount sufficient to protect property being transported or stored.

5.3.1.6 Professional Liability Insurance. For Work which requires professional engineering or professional survey services to meet the requirements of the Contract, including but not limited to excavation safety systems, traffic control plans, and construction surveying, the CONTRACTOR or Subcontractors, responsible for performing the professional services shall provide Professional Liability Insurance with a minimum limit of $500,000 per claim and in the aggregate to pay on behalf of the assured all sums which the assured shall become legally obligated to pay as damages by reason of any negligent act, error, or omission committed with respect to all professional services provided in due course of the Work of this Contract. CONTRACTOR's policy shall include the following endorsement in favor of the OWNER:

a) 30 day Notice of Cancellation endorsement CA 0244

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.6 Permits, Fees: *Add the following*:

OWNER will obtain and pay for the following permits, licenses and/or fees:

6.6.1 Site Development Permit.

6.6.2 Building Permit(s). OWNER's responsibility for obtaining and paying for the Building Permit(s) shall be limited to the following where applicable: the required Electrical Service (Aid of Construction) Fee, Water and Wastewater Tap Fees, Water and Wastewater Capital Recovery Fees, and Septic Permit Fee. The OWNER's responsibility for obtaining and paying for the Building Permit(s) excludes securing and paying for the following where applicable: Driveway Permit (Concrete) Fee, Electrical Permit, Mechanical Permit, Plumbing Permit, Water Engineering Inspection Fee, Temporary Use of Right-of Way Permit, the gas company's Gas Yard Line Contribution Fee, and any other permits/fees not listed above.

6.6.3 Texas Department of Transportation permit for Work in State rights-of-way.

ARTICLE 11 - CHANGE OF CONTRACT AMOUNT

11.4 Determination of Value of Work: *Add the following to paragraph 11.4.1.2*:

In the case of a Change Order determined by a mutually agreed lump sum or unit price properly itemized and supported by sufficient substantiating data, including documentation by subcontractors performing the work, to permit evaluation, the following method may be used:

COMPONENT ONE - The R.S. Means Co., Inc. 'Building Construction Cost Data' - latest edition - will be used as a basis for evaluating:

1a - the cost of labor (base rate, including fringe benefits),
1b - the cost of material and equipment to be incorporated in the Work, and
1c - the cost of tools, equipment and facilities necessary to accomplish the Work described in the change.

COMPONENT TWO - The costs of payroll taxes and insurance, Liability and Builder's Risk Insurance, shall be calculated as follows:

2a - Payroll taxes and Workers' Compensation Insurance 25% of payroll (Item 1a)

2b - Liability and Builder's Risk Insurance 2% of "total costs" (Items 1a, 1b, 1c, and 2a)

COMPONENT THREE - Overhead and profit shall be calculated as follows:

3a - For Subcontractors and for those portions of the Work performed by CONTRACTOR's own forces:

15% of the first $10,000.00 of costs and 10% of the balance over $10,000.00.
("costs" = Items 1a, 1b, and 1c, above, broken down into Contractor and Subcontractor costs).

3b - For the CONTRACTOR for that portion of the Work performed by Subcontractors:

10% of the first $10,000.00 of the Subcontractor costs and 7.5% of the balance over $10,000.00.

("costs" = Items 1a, 1b, and 1c, above, broken down into Subcontractor costs)

COMPONENT FOUR - Bonds
Performance and Payment Bond according to the following table ("TOTAL COST" = Items 1a, 1b, 1c, 2a, 2b, 3a, and 3b):

DOLLAR VALUE OF CONTRACT				% OF TOTAL COST OF CHANGE ORDER ADDED FOR BOND EXPENSE
$100,000	OR	LESS		2.5
$100,001	THRU	$500,000		1.5
$500,001	THRU	$2,500,000		1.0
$2,500,001	THRU	$5,000,000		0.75
$5,000,001	THRU	$7,500,000		0.70
OVER $7,500,000				0.65

a) The total costs for the change, whether additive or deductive, shall be the sum total of COMPONENTS ONE - FOUR.

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

13.7 Warranty Period: *Add the following*:

13.7.5 OWNER will utilize a "Warranty Item Form" (attached at the end of this Section) for the purpose of providing Written Notice of warranty defects to CONTRACTOR. CONTRACTOR shall date, sign, complete and return the form to OWNER when the defect is corrected, including such information on or attached to the form to describe the nature of the repairs or corrections that were made. If the defect cannot be corrected in seven (7) Calendar Days, CONTRACTOR shall provide a written explanation to the Owner's Representative describing the repairs needed and the time required to complete the repairs.

WARRANTY ITEM NO. _____ (PROJECT NAME)

The General Conditions of the Contract require that Warranty Defects be corrected within 7 days after written notice is received.

TO: _____
contractor name address / telephone / fax / email

ATTENTION OF: _____

FROM: _____
project manager name / address / telephone / fax / email

PROJECT: _____
name / location / CIP ID number

END OF ONE YEAR WARRANTY:_____

SUBJECT:_____
[ ] If checked, the damage requires immediate attention. The Contractor has been called.
[ ] If checked, the Consultant has been asked to consult with the Contractor on the problem.

PLEASE CORRECT OR REPAIR THE FOLLOWING ITEM(S):

DATE OF REQUEST_____ SIGNATURE _____
Project Manager

xc:
[ ] _____Phone No._____
[ ] _____Phone No._____
[ ] _____Phone No._____
[ ] _____Phone No._____

RESPONSE FROM CONTRACTOR: DATE CORRECTION WAS MADE:_____

The Contractor must endeavor to correct the defect within 7 calendar days after written notice is given. If the defect cannot be corrected in that time, Contractor shall provide a written explanation to the Owner's Representative describing the repairs needed and the time required to complete the repairs.

Description of corrections made:

DATE OF REPLY_____SIGNATURE_____
When the repair is complete, the contractor should return a copy to each of the following:
[ ] _____Phone No._____
[ ] _____Phone No._____
[ ] _____Phone No._____
[ ] _____Phone No._____
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PART 1 - GENERAL

1.1 SECURITY POLICY

Paramount to the City of Austin Watershed Protection Department (WPD) is the uninterrupted conveyance of stormwater at the Waller Creek Inlet Facility. The WPD shall provide high quality physical security at all its facilities and shall initiate, implement, enforce, and update as needed, specific rules and procedures to protect property, personnel, facilities, and material against unauthorized entry, trespass, damage, sabatoge, or other acts that might threaten the security of these facilities.

1.2 SECURITY PROCEDURE

The Contractor shall become familiar with this Specification Section and shall assure that all SUBCONTRACTORS do likewise. The CONTRACTOR and each SUBCONTRACTOR shall sign an affidavit attesting to the fact that they have read, understood, and will abide by this procedure. The CONTRACTOR's signed affidavit shall be delivered to WPD no later than the Pre-construction Conference and before any access is allowed to the work site.

1.3 SUBMITTALS

A. CONTRACTOR shall submit a "Contractor's Acknowledgement" form (Appendix A) signed by the Contractor's Project Manager and Site Superintendent no later than the Pre-Construction Conference. This submittal shall be an original document, with original signatures. Copies or facsimiles will not be accepted.

B. CONTRACTOR shall submit a "Contractor's Acknowledgement" form (Appendix A) signed by each Subcontractor's Project Manager and Site Supervisor no later than two weeks prior to the date the Subcontractor wishes to enter the secured area. Each submittal shall be an original document, with original signatures. Copies or facsimiles will not be accepted.

C. CONTRACTOR shall submit a sample of their company's Security Identification Badge.

D. CONTRACTOR shall submit a plan for City of Austin review and approval regarding COVID-19 Pre-Screening entry protocol and sign-in requirements for daily access to the project site for all personnel.

PART 2 - EXECUTION

2.1 WORK SCHEDULE

2.1.1 Inlet Facility

Normal work schedule at the Facility is between the hours of 6:00 A.M through 4:00 P.M. Monday through Thursday. Contractor intending to work outside of these hours, on Fridays, or on weekends should get special clearance from the Project Manager and the Facility superintendent or manager.

2.1.2 Waterloo Park

Acces to Waterloo Park will need to be coordinated with the Project Manager and Facility superintendent to coordinate with Park Operations Staff.

2.2 SITE SECURITY

The CONTRACTOR shall be responsible for maintaining absolute site security and for following all provisions of this Specification in good faith. Failure to follow any of the provisions of this procedure shall be considered a breach of this CONTRACT.

2.2.1 Fences and Gates

All existing fences and gates shall be maintained secure. If existing fences or gates must be moved or removed, equally secure temporary fencing shall be erected to maintain site security before any removal is initiated. If there is no existing fencing, temporary fencing and gates, as identified in another section of these specifications, shall be erected before any other work is performed. Gates shall be maintained closed and locked at all times. If necessary for convenient access, a guard, fluent in speaking and reading English, may be stationed at the gate to open and close it. In addition, the guard shall notify the Contractor's Site Superintendent of the arrival of all deliveries and shall examine the Identification Badges of all personnel seeking to enter the site, to assure that only persons with proper Security Identification Badges are allowed to enter.

2.2.2 Buildings

All existing buildings shall be maintained secure. If access to an existing building is controlled by an existing security system, the CONTRACTOR, all SUBCONTRACTORS, and their respective employees shall follow the procedures for access.

2.3 PERSONNEL

Personnel access to the construction site shall be limited and access will be controlled by the use of Security Identification Badges. The CONTRACTOR shall be responsible for assuring that all personnel allowed to enter the work site have proper Security Identification Badges. A proper Security Identification Badge is a picture badge, either issued by the CONTRACTOR or SUBCONTRACTOR, or a badge issued by WPD. The CONTRACTOR shall deny access to any person lacking a proper Security Identification Badge. Any person discovered on the work site without a proper identification badge will be escorted off the site and may be subject to arrest by law enforcement authorities.

2.5 IDENTIFICATION BADGES

The CONTRACTOR shall provide Security Identification Badges for each of their employees and their SUBCONTRACTORS' employees. The badges shall be picture badges. The badge must be worn by all persons at all times while present on the work site, and must be worn above the waist and be clearly visible from the front.

2.6 PARKING

Due to limited parking spaces, contractors and their subcontractors are expected to park their vehicles outside the facility. If there are spaces for parking inside the facility, the WPD superintendent will notify the contractors through their project manager or superintendents.

APPENDIX A:

CONTRACTOR'S ACKNOWLEDGEMENT
CITY OF AUSTIN WPD
FACILITY SECURITY PROCEDURES FOR CONTRACTORS

PROJECT NAME: _____

CIP/PROJECT NUMBER: _____

By signing this document, I acknowledge that I have received and reviewed Specification 00819 and that I have read it and understand its contents. Furthermore, I agree to follow all the provisions contained therein.

CONTRACTOR: _____

PROJECT MANAGER:

_____ _____
Print Signature

SITE SUPERINTENDENT:

_____ _____
Print Signature

SUBCONTRACTOR: _____

PROJECT MANAGER:

_____ _____
Print Signature

SITE SUPERINTENDENT:

_____ _____
Print Signature

END

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WAGE RATES AND PAYROLL REPORTING
Section 00830

1. PAYMENT

1.1 Classification Definitions, Building and Heavy and Highway

1.1.1 Definitions for Building Construction and Heavy and Highway classifications shall conform to the current "Occupational Information Network (O*NET)" as approved by the U.S. Department of Labor. For interpretive guidance, the Core Task list in O*NET will be used to make prevailing wage determinations. Final classification of workers will be made by the OWNER.

1.2 Minimum Wages

1.2.1 Workers on Project shall be paid not less than wage rates, including fringe benefits, as published by the Department of Labor (DOL) or the $20.00 minimum wage required by City of Austin Ordinance No. 20160324-015, whichever is higher. The Total Minimum Wage required can be met using any combination of cash and non-cash qualified fringe benefits provided the cash component meets or exceeds the $20.00 minimum wage required.

1.2.2 Such wage rates shall be used throughout the Contract. If a classification is to be used, which is not listed in the attached wage rates, CONTRACTOR shall submit to OWNER rates and classification proposed for use, for approval, prior to performance of the Work.

1.2.3 All laborers and mechanics working upon the Work for this Project shall be paid unconditionally and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by Secretary of Labor under the Copeland Act, Title 29 CFR, Part 3) full wages accrued and when due, computed at rates not less than wage rates bound herein pertaining to type of Work being performed. When Work is of such a nature that both Building and Heavy and Highway wage scales are incorporated into contract, CONTRACTOR shall pay wage rates to mechanics or laborers performing Work in more than one classification at the rate indicated for each classification for time actually worked as determined by area practice applicable to type (Site Construction Crafts or Building Construction Crafts) of Work being performed without regards to skill. Salaried specialists (project superintendent and administrative personnel only) in the permanent employment of CONTRACTOR do not fall under any Wage Classification. A supervisor/foreman who is not exempt under 29 CFR Part 541 and who spends more than a substantial amount of time (20 percent) in a given workweek as a laborer or mechanic must be paid the applicable Wage Rate for the classification of work performed for all hours engaged in such work as a laborer or mechanic.

1.2.4 Wage rates shall be posted by CONTRACTOR at site(s) of Work in prominent, easily accessible places where they can be seen by all workers. The following shall also be posted by the CONTRACTOR: City of Austin wage contact posters (English and Spanish), City of Austin Equal Employment Opportunity posters (English and Spanish), Workers' Compensation Notice (English and Spanish), Texas Payday Law (English and Spanish), City Rest Break Ordinance

(English and Spanish), City of Austin Non-Discrimination Statement (related to Title VI of the Civil Rights Act), and Federal Notices, as appropriate.

1.3 Overtime Requirements

1.3.1 No CONTRACTOR, Subcontractor, or Sub-subcontractor contracting for any part of contract Work which may require or involve the employment of laborers or mechanics shall require or permit any laborer or mechanic in any workweek in which he is employed on such Work, to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times their basic rate of pay for all hours in excess of forty hours in such workweek.

1.3.2 Overtime wages must be calculated using the Adjusted Wage Rate specified in the Wage Rate Determination or the actual basic rate of pay, whichever is higher.

2. APPRENTICES

2.1 Locally and Federally Funded Projects

2.1.1 The terms journeyman and apprentice apply to both union and independent workers, and are not intended to imply that these positions are union workers only.

2.1.2 Apprentices and Trainees will be permitted to work as such only when they are registered, individually, under a bonafide Apprenticeship or Trainee program registered with the Bureau of Apprenticeship and Training, United States Department of Labor. The allowable ratio of Apprentices or Trainees to journeymen in any craft classification shall not be greater than the ratio permitted to CONTRACTOR as stated in the registered apprenticeship program standards. Any employee listed on a payroll at an Apprentice or Trainee wage rate, who is not registered as above, shall be paid the wage rate provided in Contract for Work employee actually performed. CONTRACTOR, Subcontractor, or Subsubcontractor shall furnish to OWNER written evidence of registration of his program for Apprentices and Trainees as well as of the appropriate ratios and wage rates, for the area of construction prior to using any Apprentices or Trainees on this Contract.

3. WITHHOLDING PAYMENTS

3.1 OWNER may withhold or cause to be withheld from CONTRACTOR as much of the accrued payments as necessary to pay laborers and mechanics employed by CONTRACTOR, Subcontractors, or Sub-subcontractors the amount of wages required to comply with the Contract. In the event of nonpayment of wages to laborers or mechanics working on the site of the Work of this Contract, OWNER may, after Written Notice to CONTRACTOR, take such action as may be necessary to cause suspension of any further payments or advance of funds to CONTRACTOR until such violations have ceased and until restitution has been made. Payments may also be withheld if CONTRACTOR fails to maintain weekly payroll reports or fails to provide copies in a timely manner upon request of Owner.

4. PAYROLLS

4.1 CONTRACTOR shall keep records showing:

4.1.1 The name, address and occupation of each worker employed by the CONTRACTOR or subcontractor(s) in the construction of the public work.

4.1.2 The actual per diem wages paid to each worker

4.1.3 Employee Certification. CONTRACTOR, all levels of Subcontractors shall identify in writing, the classification agreed to by all laborers and mechanics employed by them in the execution of the Contract, and pay not less than rates specified in the attached Wage Rate Determination(s). Contractor shall prepare a completed form for the signature of Employee and a witness shall sign the form in the presence of Employee. If work performed by worker is different than the trade classification agreed upon, the worker shall be paid for that work no less than the minimum prevailing wage for that specified trade.

4.1.4 Payroll Deduction Authorization Form. CONTRACTOR, Subcontractor, and Sub subcontractor shall prepare for employee signature a payroll deduction authorization form to identify all payroll deductions excluding those required by statute, such as federal income taxes, Medicare and social security.

4.2 The record shall be open at all reasonable hours to inspection by the officers and agents of the Owner as requested. CONTRACTOR will be responsible to provide copies of records as requested by the Owner within two (2) working days. Payrolls relating to this Work shall be maintained during term of Contract and preserved for a period of three (3) years thereafter by CONTRACTOR for all laborers and mechanics working on the Work.

4.3 A Statement of Compliance, a letter signed and dated by party responsible for supervising the payment of persons employed by CONTRACTOR or subcontractor shall accompany payrolls required by Owner. The Statement of Compliance letter shall identify but is not limited to:

4.3.1 Name of signatory party and title

4.3.2 Name of project, payroll period and

4.3.3 Name of CONTRACTOR or Subcontractor

4.4 The signed letter attests that the payroll complies with 29CFR issued by the Secretary of Labor.

4.5 Federal Funding. In the event that federal funding is used:

4.5.1 Contractor and all levels of Subcontractors shall submit weekly certified payroll reports and signed wage compliance statements to the Owner's designated office no later than seven (7) calendar days after the scheduled payday.

4.5.2 Contractors and all levels of Subcontractors shall pay all "mechanics and laborers" not less often than once per week, for work performed the previous week.

4.5.3 Submit to the Owner's designated office Standard Form 1413, Statement and Acknowledgement, from each subcontractor prior to the subcontractor performing work on the project.

5. NONCOMPLIANCE

5.1 According to Chapter 2258 Texas Government Code Title 10A, a CONTRACTOR or subcontractor(s) who violates this section shall pay to the political subdivision on whose behalf the contract is made, $60 for each worker employed for each calendar day or part of the day that the worker is paid less than the wage rates stipulated in the contract. A public body shall use any money collected under this section to offset the costs incurred in the administration of this chapter.

5.2 Confirmed Disciplinary action taken by CONTRACTOR against employees who provide information during an interview or investigation by the Owner on wages received, may result in suspension or debarment from consideration of award of City contracts.

6. AREA PRACTICE

6.1 Heavy and Highway Construction Rates shall be used on this Project, unless the Project consists primarily of Building Construction and Building Construction Rates are to be used.

6.1.1 Building Construction consists generally of all aspects of construction of buildings, which are sheltered enclosures with walk-in access for the purpose of housing persons, machinery, equipment or supplies, including without limitation the installation of utilities and equipment, both above and below grade level, as well as incidental demolition, grading, utilities, paving and other site work. Buildings need not be "habitable" to be classified as Building Construction and the installation of heavy machinery and/or equipment will not generally change a Building Construction project's classification.

6.1.2 The determination of Building Construction Wage Rates includes all construction trades and work necessary to complete a building, regardless of the number of contracts involved, so long as all such contracts are closely related in purpose, time and place.

6.2 For projects that involve both Building Construction and Heavy and Highway trades, the following classifications shall be used:

6.2.1 A multiple classification shall be used if Building Construction items are more than 20% of the Heavy and Highway project cost.

6.2.2 A multiple classification shall be used if Heavy and Highway Construction items are more than 20% of the Building Construction Project cost.

6.3 Split classifications/multiple wage rate schedules: When construction work requires that an employee perform work under multiple classifications or multiple wage scales, the employer must pay that worker (at least) the highest prevailing wage or the employer payroll records must accurately set forth the times spent performing the work of each classification and under each scale. For those projects that involve both Building Construction and Heavy and Highway trades, the Heavy and Highway wage rates may only be applied to workers when engaged in site work at least five (5) feet beyond the building.

7. TEXAS OPEN RECORDS ACT

7.1 Unless covered by an exception to mandatory disclosure under the Texas Public Information Act, Chapter 552, Texas Government Code, any and all documents submitted to the City of Austin become Public Records and are, therefore, subject to public disclosure.

Wage Rates for This Project Are Attached

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WAGE RATE DETERMINATION

Building Construction Type
County Name: TRAVIS

Wages based on DOL Prevailing Wage Rate General Decision: TX20230271 01/27/2023 and City of Austin Ordinance #20160324-015 Resolution #20160324-020

DOL Rate column is for information only. The Total Minimum Wage Rate is derived from the Adjusted Wage Rate Required pursuant to City Ordinance plus the DOL Fringes and can be met using any combination of cash and non-cash qualified fringe benefits, provided the cash component is at least $20.00/hour.

Classification	DOL Rate For info Only	Adjusted Wage Rate Required Pursuant to City Ordinance	DOL Fringes	Total Minimum Wage Rate Required
Asbestos Worker/Heat & Frost Insulator (Duct, Pipe, and Mechanical System Insulation)	$ 28.10	$ 28.10	$ 8.29	$ 36.39
Boilermaker	$ 29.47	$ 29.47	$ 24.10	$ 53.57
Bricklayer	$ 20.07	$ 20.07	$ -	$ 20.07
Carpenter	$ 26.00	$ 26.00	$ 9.12	$ 35.12
Carpenter (Acoustical Ceiling Installation only)	$ 14.00	$ 20.00	$ -	$ 20.00
Carpenter (Form Work Only)	$ 15.62	$ 20.00	$ 0.05	$ 20.05
Cement Mason/Concrete Finisher	$ 15.71	$ 20.00	$ -	$ 20.00
Drywall Finisher/Taper	$ 17.06	$ 20.00	$ 4.43	$ 24.43
Drywall Hanger and Metal Stud Installer	$ 17.47	$ 20.00	$ 3.45	$ 23.45
Electrical Installer (Sound and Communication Systems, Excluding Wiring)	$ 18.00	$ 20.00	$ 2.30	$ 22.30
** Electrician (Excludes Installation of Sound and Communication Systems)	$ 31.52	$ 31.52	$ 9.20	$ 40.72
***Elevator Mechanic	$ 47.28	$ 47.28	$ 37.335	$ 84.615
Floor Layer (Carpet)	$ 21.88	$ 21.88	$ -	$ 21.88
Glazier	$ 12.83	$ 20.00	$ -	$ 20.00
HVAC Mechanic (HVAC Unit Installation Only)	$ 23.78	$ 23.78	$ 6.89	$ 30.67
Ironworker, Ornamental	$ 26.76	$ 26.76	$ 7.88	$ 34.64
Ironworker, Reinforcing	$ 12.27	$ 20.00	$ -	$ 20.00
Ironworker, Structural	$ 20.73	$ 20.73	$ 5.24	$ 25.97
*Lead Paint or Asbestos Abatement Worker	*	$ 20.00	$ -	$ 20.00
Laborer, Common or General	$ 11.44	$ 20.00	$ -	$ 20.00
Laborer, Mason Tender - Brick	$ 12.22	$ 20.00	$ -	$ 20.00
Laborer, Mason Tender - Cement/Concrete	$ 11.85	$ 20.00	$ -	$ 20.00
Laborer, Pipelayer	$ 12.45	$ 20.00	$ -	$ 20.00
Laborer, Roof Tearoff	$ 11.28	$ 20.00	$ -	$ 20.00

Operator, Backhoe/Excavator/Trackhoe	$ 19.43	$ 20.00	$ 3.49	$ 23.49
Operator, Bobcat/Skid Steer/Skid Loader	$ 13.00	$ 20.00	$ -	$ 20.00
Operator, Bulldozer	$ 14.00	$ 20.00	$ -	$ 20.00
Operator, Crane	$ 34.85	$ 34.85	$ 9.85	$ 44.70
Operator, Drill	$ 14.50	$ 20.00	$ -	$ 20.00
Operator, Forklift	$ 16.64	$ 20.00	$ 6.26	$ 26.26
Operator, Grader/Blade	$ 19.30	$ 20.00	$ -	$ 20.00
Operator, Loader	$ 14.00	$ 20.00	$ -	$ 20.00
Operator, Mechanic	$ 18.75	$ 20.00	$ 5.12	$ 25.12
Operator, Paver (Asphalt, Aggregate, and Concrete)	$ 16.03	$ 20.00	$ -	$ 20.00
Operator, Roller	$ 11.25	$ 20.00	$ -	$ 20.00
Painter (Brush, Roller, and Spray, Excludes Drywall Finishing/Taping)	$ 18.76	$ 20.00	$ 6.35	$ 26.35
Pipefitter (Including HVAC Pipe Installation)	$ 33.15	$ 33.15	$ 15.37	$ 48.52
Plumber, Excludes HVAC Pipe Installation	$ 23.57	$ 23.57	$ 6.37	$ 29.94
Roofer	$ 12.00	$ 20.00	$ -	$ 20.00
*Roofer, Metal	$ 14.05	$ 20.00	$ -	$ 20.00
Sheet Metal Worker (Excluding HVAC Duct Installation)	$ 28.35	$ 28.35	$ 15.56	$ 43.91
Sheet Metal Worker (HVAC Duct Installation)	$ 28.35	$ 28.35	$ 15.56	$ 43.91
Sprinkler Fitter (Fire Sprinklers)	$ 33.11	$ 33.11	$ 23.30	$ 56.41
Tile Finisher	$ 11.32	$ 20.00	$ -	$ 20.00
Tile Setter	$ 16.35	$ 20.00	$ -	$ 20.00
Truck Driver, Dump Truck	$ 12.39	$ 20.00	$ 1.18	$ 21.18
Truck Driver, Flatbed Truck	$ 19.65	$ 20.00	$ 8.57	$ 28.57
Truck Driver, Semi-Trailer Truck	$ 12.50	$ 20.00	$ -	$ 20.00
Truck Driver, Water Truck	$ 12.00	$ 20.00	$ 4.11	$ 24.11
Waterproofer	$ 16.30	$ 20.00	$ 0.06	$ 20.06

http://www.wdol.gov/wdol/scafiles/davisbacon/tx.html

See below for Additional Wage Information.

Note: *Lead Paint & Asbestos Abatement and Roofer, Metal Classifications have been added to this Prevailing Wage Rate Determination pursuant to a City of Austin Prevailing Wage Survey (trades absent from DOL).

The Wage Compliance information detailed below was excerpted from DOL General Decision TX20230271 or other sources.

1. ADDITIONAL TRADE INFORMATION

**Electricians - Including low voltage wiring for computers, fire/smoke alarms.
***Elevator Mechanics – 6% under 5 years based on regular hourly rate for all hours worked. 8% over 5 years based on regular hourly rate for all hours worked as Vacations Pay Credit. Also, must be paid for 8 holidays - New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, and Veterans Day.
Welders - Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added upon the advance approval of City of Austin Contract Administration. CONTRACTOR shall submit to City of Austin Contract Administration for review the classification, a bona fide definition of work to be performed and a proposed wage with sample payrolls conforming to area practice **prior** to the start of the job for that type of work.

2. WAGES

The Total Wage may be met by any combination of cash wages and credible "bona fide" fringe benefits paid for by the employer. Overtime wages must be calculated using the Adjusted Wage Rate specified in the Wage Rate Determination or the actual basic rate of pay, whichever is higher. City of Austin Ordinance No. 20160324-015 Resolution #20160324-020 requires that construction workers are paid a Minimum Wage of at least $20.00/hour. The cash portion of their compensation must meet or exceed this amount.

3. CREDITING FRINGE BENEFIT CONTRIBUTIONS TO MEET DBA/DBRA AND CITY OF AUSTIN REQUIREMENTS

The Davis-Bacon Act (and 29 CFR 5.23), list fringe benefits to be considered. Examples are:

> Life Insurance
> Health Insurance
> Pension
> Vacation
> Holidays
> Sick Leave

Note: The use of a truck is not a fringe benefit; a Thanksgiving turkey or Christmas bonus is not a fringe benefit. No credit may be taken for any benefit required by federal, state, or local law such as: workers compensation, unemployment compensation; or social security contributions.

Contributions to fringe benefit plans must be made regularly, e.g. daily, weekly, etc. They must be more frequent than quarterly. (See 29 CFR 5.5 (a)(1)(I)) A periodic bonus may not be counted as a fringe benefit.

4. ANNUALIZATION OF BENEFIT COSTS

If a firm provides an electrician with $200 per month medical insurance, to calculate allowable fringe benefit credit contributions per hour, the formula ([$200 x 12 months] divided by 2080 hours = $1.15 per hour) should be used.

5. PROPER DESIGNATION OF TRADE

A work classification on the wage decision for each worker must be made based on the actual type of work he/she performed, and each worker must be paid no less than the wage rate on the wage decision for that classification **regardless** of his or her level of skill.

6. SPLIT CLASSIFICATION

If a firm has employees that perform work in more than one classification, it can pay the wage rates specified for each classification ONLY if it maintains accurate time records

showing the amount of time spent in each classification. If accurate time records are not maintained, these employees must be paid the highest wage rate of all the classifications of work performed by each worker. Accurate time records tracking how many hours a worker performed the work of one trade and then switched to another trade must be accounted for on a daily basis and reflected on Employer Certified Payroll accordingly.

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($16.20) or 13658 ($12.15). Please see the Note at the top of the wage determination for more information.

==========

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

6.1 Union Rate Identifiers

A four-letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: **PLUM0198-005 07/01/2014**. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014. Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

6.2 Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: **SULA2012-007 5/13/2014**. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier. Survey wage rates are not updated and remain in effect until a new survey is conducted.

6.3 Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: **UAVG-OH-0010 08/29/2014**. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

7. WAGE DETERMINATION APPEALS PROCESS

7.1 Has there been an initial decision in the matter? This can be:

.1 An existing published wage determination
.2 A survey underlying a wage determination
.3 A Wage and Hour Division letter setting forth a position on a wage determination matter
.4 A conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in .**2** and **.3** should be followed.

7.2 With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determination
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W. Washington, DC 20210

7.3 If the answer to the question in .**1** is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor.
200 Constitution Avenue, N.W. Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

7.3 If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W. Washington, DC 20210

7.4 All decisions by the Administrative Review Board are final.

END

The City of Austin Construction Training Program (the "Program") is intended to train workers on City of Austin's construction projects in order to develop a pool of qualified, ready-to-work skilled and semi-skilled construction workers. This training commitment is not intended and shall not be used to discriminate against any applicant.

Training Requirement. Establishment of the Construction Training Requirement for each project will be based on project scope, dollar amount, and opportunities available to achieve the training requirements. The requirements will be established either prior to solicitation, or during contract negotiations, using the criteria in Charts A and B. Program requirements will be subject to availability of Trainees and Graduates.

Chart A - Evaluation Criteria
1. Material cost vs labor cost 2. Scope of work 3. Schedule of values (a comprehensive list of work for a particular project) 4. Project duration and schedule 5. Unique aspects of the project 6. Available training programs for the specific training plan 7. Workforce determined by the number of workers that will be on the project enough days to establish a training program.

Chart B - CTP Training Requirement

Construction Budget	Trainee Requirement	Trainees must be a Current Enrollee, or Graduate* of a COA-Approved:
$500K - $2.5M	2	• Pipeline Organization[1)] or • DOL-Registered/Approved/Certified[2)] Apprenticeship, OJT, or Bilingual Training Program
Over $2.5M - $5M	4	• Pipeline Organization[1)] or • DOL-Registered/Approved/Certified[2)] Apprenticeship, OJT, or Bilingual Training Program
Over $5M - $10M	6	• Pipeline Organization[1)] or • DOL-Registered/Approved/Certified[2)] Apprenticeship, OJT, or Bilingual Training Program
Over $10M	15% of Total Workforce	• DOL-Registered/Certified[2)] Apprenticeship or Bilingual Training Program for Vertical (BC) Projects • DOL-Approved/Certified[2)] OJT or Bilingual Training Program for Horizontal (HH) Projects

* Graduates cannot satisfy more than half of the training requirement; current employees of a company may also be enrolled in a COA-Approved DOL Registered/ Approved/Certified Program to meet the requirement.

[1)] Click link to view COA-Approved list of Pipeline Organizations for Construction Ready Trainees.

[2)] Click link to view COA-Approved list of DOL-Registered/Approved/Certified Apprenticeship, OJT, or Bilingual Training Programs.

1. DEFINITIONS

1.1 *Capital Contracting Office (CCO)* – The City of Austin's Office responsible for administering the Construction Training Program

1.2 *City's Approved Minimum Wage Rate* – a minimum wage rate established by the City of Austin for workers performing construction activities on City of Austin contracts

1.3 *Construction-Ready Trainee* - a graduate or current trainee of a Pipeline training program, enrollee or graduate of a DOL-registered Apprenticeship Program, enrollee or graduate of a DOL-approved Training Program, and/or an enrollee or graduate of a DOL-certified Bilingual Training Program.

1.4 *Pipeline* - group of organizations that provide pre-employment, pre-apprentice, or apprentice readiness training related to construction

1.5 *Training Plan:* a plan identifying how a contractor intends to meet its training requirement, subject to OWNER's review and approval

1.6 *Construction Training Program Training Report* – a form provided by the OWNER which documents the contractor's training activities and trainee status

2. TRAINING REQUIREMENT

2.1 The Construction Ready Trainee requirement for this project is two (2).

3. CONTRACTOR'S RESPONSIBILITIES

3.1 No later than 10 business days after Council Award, the CONTRACTOR shall provide a Training Plan for OWNER's approval, specifying how the CONTRACTOR intends to satisfy the contract requirement. The CONTRACTOR will have fulfilled its responsibilities under Section 00840 of the contract by having complied with the CONTRACTOR's Training Plan approved by the OWNER.

3.2 In the event that a CONTRACTOR subcontracts a portion of the contract work, CONTRACTOR shall determine if the requirements of the program will be assumed by the subcontractor(s). The CONTRACTOR should ensure that this training provision is made applicable to such subcontract; however, the CONTRACTOR shall retain the responsibility for meeting the training requirements imposed by this provision.

3.3 Trainee must be paid at least the City's Approved Minimum Wage Rate.

3.4 OWNER will provide a list of available Pipeline organizations. The CONTRACTOR shall contact those Pipeline organizations as needed in order to recruit workers for the program.

3.5 The CONTRACTOR shall submit a Training Report to OWNER for each Trainee no later than 30 calendar days after the Notice-to-Proceed. This Training Report must be submitted monthly thereafter for the duration of the project. This shall indicate work classification and graduation details, as well as training status changes. If a trainee is terminated or resigns, the CONTRACTOR is required to make a reasonable effort to replace the trainee within 30 calendar days.

3.6 For each trainee performing work on the project, the CONTRACTOR must submit to CCO a completed Employee Certification Form for each Trainee.

3.7 CONTRACTOR's Reasonable Efforts to Comply. The CONTRACTOR will be responsible for demonstrating the steps taken to meet the trainee requirement. If CONTRACTOR has fewer trainees employed on the project than specified in the Training Plan, the CONTRACTOR must submit evidence of recruitment efforts, including:

3.7.1 contacts made to OWNER for a current list of approved training providers
3.7.2 log of applicants contacted
3.7.3 log of training organizations contacted
3.7.4 documented outreach efforts made to all available training organizations (per current OWNER list) to satisfy the requirement
3.7.5 documentation of CONTRACTOR's recruitment efforts performed until program requirements are met or project is complete as part of the Construction Training Program Training Report

4. NON-COMPLIANCE

4.1 Lack of demonstrated reasonable effort to comply with the Construction Training Program will be reflected in the Contractor's Performance Evaluation and may impact the receipt of future business with the City of Austin.

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Notice to Bidders: *This form, Addendum, Section 00900, is included for your information only. If an actual Addendum is issued for this project, the format shown below will be used. Additionally, issued addenda will be bound at the beginning of the Project Manual following the Table of Contents at the time of contract execution.*

ADDENDUM NO. _____

Date _____, _____

City of Austin

Project Name _____

C.I.P. No. _____ IFB No.: _____

This Addendum forms a part of the Contract and corrects or modifies original Bid Documents, issued on _____, ____. **Acknowledge receipt of this addendum in space provided on bid form.** Failure to do so may subject bidder to disqualification.

A. Project Manual Revisions:

B. Drawing Revisions:

This addendum consists of ____ page(s)/sheet(s).

_____
Approved by OWNER

_____
Approved by ENGINEER/ARCHITECT (as applicable per license requirements)

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The Work of this Contract includes sustainability requirements as shown in the Division 1 Sections 01352 and/or 01505 and all other applicable specification sections. It is the intent of the Owner to work in partnership with the Contractor in implementing sustainable construction practices to the greatest extent possible.

PART 1 - GENERAL

1.1 Related Documents:

Drawings and general provisions of Contract, including General Conditions, Section 00700, and Supplemental General Conditions, Section 00810, and Division 1 requirements.

1.2 DESCRIPTION OF WORK

1.21 Scope of Work

A. This section describes the Project in general and provides an overview of the extent of the Work to be performed by the CONTRACTOR. Detailed requirements and extent of Work is stated in the applicable Specification Sections and shown on the Drawings. CONTRACTOR shall, except as otherwise specifically stated herein or in any applicable part of these Contract Documents, provide and pay for all labor, materials, equipment, tools, construction equipment, and other facilities and services necessary for proper execution, testing, and completion of the Work.

B. Any part or item of the Work which is reasonably implied or normally required to make the installation satisfactorily operable shall be performed by the CONTRACTOR and the expense thereof shall be included in the applicable unit prices or lump sum prices bid for the Work. It is the intent of these Specifications to provide the OWNER with the complete system. All miscellaneous appurtenances and other items of Work that are incidental to meeting the intent of the Specifications shall be considered as having been included in the applicable unit prices or lump sum prices bid for the Work even though these appurtenances and items may not be specifically called for in the Bid Documents.

C. The Work shall include furnishing all tools, labor, materials, equipment, and miscellaneous items necessary for the complete construction of the Waller Creek Tunnel Inlet Facility Wet Well Mechanical Screening System project. This Contract includes, briefly and without force and effect upon the documents, the following:

1. Installation of two (2) multi-rake mechanical screen cleaning mechanisms. Installation of multi-rake screen cleaning equipment includes but is not limited to all rakes, bar screens, discharge chutes, debris hoppers, water level sensors, debris monitoring level sensors, motors, sprockets, and structural support structure.
2. Installation of two (2) submersible irrigation pumps. Installation of irrigation pumps includes but is not limited to all associated piping and appurtenances to connect from the proposed pumps to the proposed irrigation skid and all associated piping and appurtenances to connect from the proposed irrigation skid to the irrigation system connection point and hydrants on the operating deck.
3. Demolition of existing irrigation skid and installation of one (1) packaged irrigation skid to incorporate proposed irrigation pumps includes but is not

limited piping and valving, variable frequency drives, pressure switch, and PLC. Provide control capability that allows for pump control, monitoring, and communications to the existing SCADA system.

4. Installation of an air quality monitoring system for the lower wet well channel area as shown on PLANS.
5. Providing equipment access by modifying existing handrails, guardrails and grated walkways on the operations deck and in the upper and lower wet well channel areas.
6. Installation of all power and control cables.
7. Removal of all construction debris and site clean up.
8. All remaining and associated items of work contained in the Contract Documents as shown on PLANS.

1.22 Location of Project

A. The Project begins at the Waller Creek Inlet Facility at 500 East 12th Street, Austin, Texas. The project location/route is shown on the Drawings.

1.23 Contractor's Responsibilities

A. Execute all Work, including excavation, installing pipe, backfill, miscellaneous concrete and testing. The Work of this Contract is specified in the City of Austin Standard Specifications, Special Provisions and Special Specifications listed in the Table of Contents.

B. Secure all construction-related permits, other than those provided by OWNER as described in paragraph 6.6 of Section 00810, Supplemental General Conditions, and pay for the same.

C. Arrange for the necessary temporary water and electric service and pay for these services and all water and electricity consumed during the construction Work.

D. Provide adequate temporary sanitary facilities.

1.24 Easements and Rights-Of-Way

CONTRACTOR shall confine his construction operations within the limits indicated on the Drawings, and shall use due care in placing construction tools, equipment, excavated materials, and pipeline materials and supplies so as to cause the least possible damage to property and interference with traffic. If the CONTRACTOR requires additional easement for his operations, the CONTRACTOR is solely responsible for acquisition and maintenance of the easement. No additional compensation will be provided by the OWNER.

A. Easements - Easements across private property are indicated on the Drawings. CONTRACTOR shall set stakes to mark the boundaries of construction easement across private property. The stakes shall be protected and maintained until completion of construction and cleanup.

B. Rights-of-Way - Permits for Work in rights-of-way shall be obtained by the CONTRACTOR. All Work performed and all operations of CONTRACTOR, his employees, or subcontractors, within the limits of railroad and highway rights-of-way, shall be in conformity

with the requirements and be under the control (through OWNER) of the railroad or highway authority owning, or having jurisdiction over and control of, the right-of-way in each case.

1.25 Operation of Existing Facilities

Existing water and wastewater facilities shall be kept in continuous operation throughout the construction period. No interruption will be permitted which adversely affects the degree of service provided. Provided permission is obtained from OWNER in advance, portions of the existing facilities may be taken out of service for short periods corresponding with periods of minimum service demands.

CONTRACTOR shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities in operation during the construction period.

1.26 Connections to Existing Facilities

Unless otherwise specified or indicated, CONTRACTOR shall make all necessary connections to existing facilities including structures, drain lines, and utilities. In each case, CONTRACTOR shall receive permission from OWNER or the owning utility prior to undertaking connections. CONTRACTOR shall protect facilities against deleterious substances and damage.

Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials and labor shall be on hand at the time of undertaking the connection. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

1.27 Unfavorable Construction Conditions

No portion of the Work shall be constructed under conditions which adversely affect the quality or efficiency thereof, unless special means or precautions are taken by CONTRACTOR to perform the Work in a proper and satisfactory manner.

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MEASUREMENT AND PAYMENT LUMP SUM CONTRACTS
Section 01025

For this Project, all measurement and payment sections, including standard technical specifications and special specifications, are modified by this Section.

All work items installed, provided, constructed, etc. with the exception of the unit price items listed in the 300L, shall not be paid for separately but shall be considered subsidiary to the lump sum bid price for the Project. The cost of all work materials, labor, overhead, insurance, equipment, etc. necessary to finish the work complete in place shall be included in the lump sum bid price for the project.

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PART 1 - GENERAL

1.01 COORDINATION WITH OWNER

A. Coordination of OWNER's Work by Others: Reference Contract General Conditions for coordination of OWNER's Work by others, if any, and coordinate CONTRACTOR's Work with OWNER or OWNER's designated coordinator.

B. Other Work may be performed at site by others during scheduled performance of Work under these Contract Documents.

C. Other Contractors:
   1. Other Contractor and Contact Person: To be provided prior to Notice to Proceed or when available.

1.02 UTILITIES

A. Coordinate Work with various utilities within Project limits in accordance with the General Conditions. Notify applicable utilities prior to commencing Work, and if damage occurs, or if conflicts or emergencies arise during Work.

1.03 PROJECT MEETINGS

A. Reference Section 01200, "Project Meetings".

1.04 OTHER CONTRACTS

A. The OWNER may have other construction projects being performed simultaneously with this project at the site. Limits of construction and project work area for this project are indicated on the PLANS. Afford utility companies and other contractors reasonable opportunity for introduction and storage of their materials and execution of their work. Work under this contract connecting to work in other contracts must be carefully coordinated with that construction by others.

1.05 ACCESS FOR OTHERS

A. Access to all roads is to be maintained throughout construction period. Under no circumstances will access to roads be blocked or denied to traffic during construction of this Contract, unless noted on the PLANS.

1.06 OPERATION OF AND CONNECTION TO EXISTING FACILITIES

A. Existing water and wastewater facilities shall be kept in continuous operation throughout the construction period. No interruption will be permitted which adversely affects the degree of service provided.

B. Provided permission is obtained from OWNER in advance, portions of the existing facilities may be taken out of service for short periods corresponding with periods of minimum service demands.

C. CONTRACTOR to provide temporary facilities and make temporary modifications as necessary to keep the existing facilities in operation during the construction period.

1.07 OWNER'S OCCUPANCY

A. OWNER may occupy the premises during the period of construction for the conduct of its normal operations. Cooperate with OWNER in all construction operations to minimize conflict and to facilitate OWNER usage.

1.08 PARTIAL UTILIZATION BY THE OWNER

A. Reference the General Conditions for requirements regarding OWNER's utilization of a portion of the Work. Unless agreed in writing prior to OWNER's use, the following conditions to apply:
   1. CONTRACTOR's Responsibilities:
      a. Provide access for OWNER'S personnel.

1.09 PHYSICAL CONDITIONS

A. Exercise care to verify locations of existing subsurface structures and underground facilities.

B. Thoroughly check immediate and adjacent areas subject to excavation by visual examination (and by electronic metal and pipe detection equipment, as necessary) for indications of subsurface structures and underground facilities.

C. Make exploratory excavations where existing underground facilities or structures may potentially conflict with proposed underground facilities or structures. Conduct exploratory excavations in presence of ENGINEER and sufficiently ahead of construction to avoid possible delays to CONTRACTOR's Work. Notify ENGINEER at least 24-hours prior to excavation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CUTTING, FITTING AND PATCHING

A. General: Reference the General Conditions.
   1. Cut, fit, adjust, or patch Work and work by others, including excavation and backfill as required, to make Work complete.
   2. Obtain prior written authorization of ENGINEER before commencing Work to cut or otherwise alter:
      a. Structural or reinforcing steel, structural columns or beams, elevated slabs, trusses, or any other structural member.
      b. Weather- or moisture-resistant elements.
      c. Efficiency, maintenance, or safety of element.
      d. Work of others.
   3. Refinish surfaces to provide an even finish.
      a. Refinish continuous surfaces to nearest intersection.
      b. Refinish entire assemblies.
      c. Finish restored surfaces to such planes, shapes, and textures that no transition between existing work and proposed Work or proposed Work and work by others is evident in finished surfaces.
   4. Restore existing work, underground facilities, and surfaces that are to remain in completed Work including concrete-embedded piping, conduit, and other utilities as specified and as shown.
   5. Make restorations with new materials and appropriate methods as specified for new Work of similar nature; if not specified, use best recommended practice of manufacturer or appropriate trade association.
   6. Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces and fill voids.
   7. Remove specimens of installed Work for testing when requested by ENGINEER.

3.02 CHEMICALS FOR START-UP (NOT USED)

3.03 - 3.10 (NOT USED)

3.11 MEASUREMENT AND PAYMENT

No separate measurement or payment for Work performed under this Section. Include cost of same in Contract price bid for Work of which this is a component part.

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SECTION 01046

SEQUENCE OF CONSTRUCTION

PART 1 GENERAL

1.01 SUMMARY

A. This document establishes a proposed sequence of construction for Work activities and defines constraints, which are to be accommodated, and specific time restraints associated with the construction activities. CONTRACTOR shall review this proposed sequence of construction and thoroughly familiarize itself with all constraints for maintaining continuous, unimpeded operations of the Waller Creek Inlet Facility at Waterloo Park (hereinafter referred to as the Inlet Facility), unless noted otherwise. CONTRACTOR shall propose a sequence of construction as part of its proposed final baseline progress schedule incorporating these constraints and secure concurrence of OWNER prior to starting any work on the areas addressed by this sequence of construction. Should the CONTRACTOR decide to adopt this proposed sequence of construction as its proposed sequence of construction, CONTRACTOR does so with the understanding that this in no way relieves the CONTRACTOR from its obligations for preparation of a workable sequence of construction and assuming full responsibility for same.

B. This specification addresses the sequence of construction for the proposed Waller Creek Tunnel Inlet Facility – Wet Well Mechanical Screening System project. This sequence of construction only mentions components of Work that are sequence-sensitive, not all portions of Work required by Contract. CONTRACTOR is responsible for developing additional construction sequencing required for completion of the work.

C. All of the above components must be completed within the limits of construction and project phasing defined on the PLANS and SPECIFICATIONS. Other contractors will be preforming work on this site and this project work shall be coordinated with the work of these other contractors.

1.02 RELATED REQUIREMENTS

A. Related work as called for on PLANS or specified in this or other Specification Sections.

B. Work must be scheduled and performed to have minimal impact on the operations of the Inlet Facility, and must maintain continuous, unimpeded facility operations at all times, unless noted otherwise.

C. Although it is the OWNER's intent to accommodate the needs of the CONTRACTOR, the Inlet Facility operational requirements take precedence over CONTRACTOR's activities. Therefore, any interruption of facility operations must be planned and coordinated with the OWNER at least two (2) weeks prior to any required interruption and is subject to the operational requirements and constraints of the Inlet Facility.

D. CONTRACTOR shall coordinate his construction activities and limits of construction with other on-site Contractors to avoid "interruption of facility operations" and "interruption of park operations".

E. The work will take place in and around a natural waterway. CONTRACTOR will be responsible for coordination with the OWNER regarding a Significant Rain Event response as described later in this Specification. OWNER may direct CONTRACTOR to stop work and vacate the work area when OWNER anticipates a rain event. However,

CONTRACTOR is equally responsible for anticipating rain event and safe guarding his facilities and the site.

F. All electrical power transfers to be performed under unloaded conditions.

1.03 REFERENCES (NOT USED)

1.04 DEFINITIONS

A. "Interruption of facility operations" is defined as any activity that will result in a change in the current method of facility operation. CONTRACTOR shall request such "interruption of facility operations" from the OWNER no later than two (2) weeks prior to such need for "interruption of facility operations" and shall confirm OWNER's approval for such interruption no less than ninety-six (96) hours in advance. OWNER may defer any planned interruption of facility operations as required to maintain unimpeded operations. An unanticipated need for "interruption of facility operations" may be accommodated at the sole discretion of the OWNER on a limited request basis only if such interruption will not adversely affect facility operations. Requests are to be submitted in accordance with Paragraph 1.06.

B. "Interruption of park operations" is defined as any activity that will result in a disruption to events scheduled at the park. CONTRACTOR shall request such "interruption of park operations" from the OWNER no later than two (2) weeks prior to such need for "interruption of park operations" and shall confirm OWNER's approval for such interruption no less than ninety-six (96) hours in advance. OWNER may defer any planned interruption of park operations as required to maintain unimpeded operations. An unanticipated need for "interruption of park operations" may be accommodated at the sole discretion of the OWNER on a limited request basis only if such interruption will not adversely affect park operations. Requests are to be submitted in accordance with Paragraph 1.06.

C. The terms "open, close, start, stop, operate, verify, energize, de-energize, transfer, switch-over, etc." when used in conjunction with the facilities that are in-service or about to be placed in-service are understood to mean: OWNER's operation and maintenance staff is to perform that operational function of OWNER's equipment unless otherwise specifically approved and authorized by OWNER for CONTRACTOR to perform the operation under the direct supervision of the OWNER's operation or maintenance staff. CONTRACTOR is to not abuse OWNER's equipment during these operations, however, it is understood that equipment failure may occur during operation. CONTRACTOR will not be held responsible, provided it was not due to CONTRACTOR's abuse or improper operations of the equipment.

D. The term "operational test" refers to the period of specified duration that the installed system is tested to verify operational integrity of a system prior to having the system be placed in-service.

1.05 SYSTEM DESCRIPTION

A. The Inlet Facility at Waterloo Park diverts floodwater from Waller Creek to Lady Bird Lake through a bypass tunnel. An existing dam structure at the Inlet Facility prevents floodwater from entering Waller Creek. The Inlet Facility consists of six (6) screen bays arranged in a semi-circle around the perimeter of the north face of the Inlet Facility. Each of these six (6) screen bays include a stainless steel bar screen that is approximately 16 feet wide and 30 feet high, installed at a 75 degree angle to screen debris from the floodwater prior to entering the Tunnel. A morning glory spillway behind the screens creates an inlet pool at the Inlet Facility.

The Inlet Facility includes multiple pumping systems that utilize the water in the inlet pool and the Tunnel to provide water for irrigation, water features, or recirculation use. Water is pulled from either the lower pump wet well or upper pump wet well. The lower pump wet well receives water directly from the Tunnel whereas the upper pump wet well receives water from the Inlet Pool. Modifications in this area include, but are not limited to:

1. Replacing the netting screen in the upper wet well channel with a multi-rake bar screen cleaning mechanism. Installation of the multi-rake bar screen cleaning equipment includes but is not limited to all rakes, bar screens, chains, discharge chutes, debris hoppers, debris monitoring level sensors, motors, sprockets, and structural supports.

2. Replacing the netting screen in the lower wet well channel with a multi-rake bar screen cleaning mechanism. Installation of the multi-rake bar screen cleaning equipment includes but is not limited to all rakes, bar screens, chains, discharge chutes, debris hoppers, debris monitoring level sensors, motors, sprockets, and structural supports.

3. Providing equipment access by modifying existing handrails and guardrails on the operations deck and upper and lower wet well channel area. Providing maintenance access by modifying the existing grated walkways and adding new grated walkways.

4. Providing a new air quality monitoring system in the lower wet well channel area at the location shown on the PLANS.

5. Providing a new Irrigation Pump Skid consisting of two (2) submersible irrigation pumps within the upper wet well, two (2) removable basket filters around the pumps, two (2) variable speed drives, Programmable Logic Controller, water level float switch, magnetic flowmeter, pressure transducer, pressure relief valves, isolation valves, skid filter, and all accompanying piping and instrumentation as detailed in Specification Section 11311, “Irrigation Pump Station”. Provide pump control and communication to the existing SCADA system. Provide discharge piping from the irrigation skid to the irrigation valve outside of the Inlet Facility as shown on the PLANS.

B. Electrical System: The majority of existing equipment of the power distribution system is located indoors in the Electrical Room of the existing Inlet Facility Building. Contractor shall provide power, as shown on the electrical drawings, to both multi-rake bar screens cleaning mechanisms, both debris monitoring level sensors, the air quality monitoring system, and the irrigation pumps.

1. Modifications in this area include, but are not limited to:

   a. Installation of power and control cables to the multi-rake bar screen cleaning equipment motor in the upper wet well channel and the lower wet well channel.

   b. Installation of power and control cables to the debris monitoring level sensor equipment.

   c. Installation of power and control cables to the air quality monitoring system equipment.

   d. Installation of power and control cables to the proposed irrigation pumps and proposed irrigation skid.

e. Please refer to the PLANS for additional information and requirements.

C. Instrumentation and Control System: The existing control system architecture for the Inlet Facility consists of programmable logic controllers (PLCs). The existing PLCs are located indoors in the air conditioned electrical room inside of the Inlet Facility building.

1. Modifications in this area include, but are not limited to:

a. Programming the packaged control system to control the operation of each multi-rake bar screen cleaning equipment based on head differential of water surface elevation levels on both sides of the screen using the proposed level instruments.

b. Providing communication to the existing SCADA system for alarms from the debris monitoring level sensors.

c. Providing communication to the existing SCADA system for alarms from the air quality monitoring system.

d. Providing communication to the existing SCADA system to allow for monitoring of flows and alarms from the proposed irrigation skid.

1.06 SUBMITTALS

A. Furnish in accordance with Specification Section 01300, “Submittals”.

1. CONTRACTOR’s sequence of construction defining work to be performed, including the following items

a. Definition of the start date, duration and end date for each of the segments of work defined in Part 3 – EXECUTION.

b. For each segment of work, define activities to be performed by or witnessed by the OWNER and date on which these activities are to be performed.

c. Definition of dates that the CONTRACTOR will not be allowed access to the upper wet well channel and/or lower wet well channel or has to limit construction activities due to planned events at the park. CONTRACTOR shall coordinate weekly with Park Operations and Inlet Facility Operations staff to identify future dates and times of planned park events.

2. Provide a list of any interruption of facility operations that is required as part of this project, define purpose for interruption; location(s) of the interruption, date and time of interruption; and duration of interruption.

a. Interruption required by Contractor

3. Provide a list of any interruption of park operations that is required as part of this proiect, define purpose for interruption, location(s) of the interruption, date and time of interruption, and duration of interruption.

a. Interruption required by Contractor

4. Maintain and distribute weekly a three (3)-week look ahead schedule that will include other work by the Owner, Contractor, and Park Operator as it is provided.

5. Provide complete list of equipment and material that is required to perform each segment of the Work.

6. For construction equipment, submit spill prevention plans and procedures to Engineer for review and approval prior to the start of construction.

    a. Plan shall include procedure the Contractor proposes to follow if there is a spill to implement containment and clean up. Define containment and clean up kits that will be on hand at the job site at all times.

    b. Construction equipment shall be equipped with spill prevention measures and fuel secondary containment, or gas driven machineries shall be utilized.

    c. The Contractor is limited to the types of fuel products for equipment that are used for construction inside the Inlet Pool. The following fuel products may be used during construction:

        (1) Propane or compressed natural gas

        (2) Biodiesel (B100) meeting ASTM D6751-08. Note that biodiesel blends with petroleum diesel will not be allowed without written consent by the Owner.

        (3) Straight vegetable oil (SVO) or pure plant oil (PPO)

        (4) Gasoline / diesel generators are not permissible except for emergency backup. Gasoline fuels and fueling locations must be at least 100 feet from the Waller Creek Inlet Pool.

    d. The Contractor is limited to vegetable based hydraulic fluids for equipment that will be used within the upper wet well channel and lower wet well channel. Except when authorized by the Owner in writing, hydraulic fluids must meet the following specifications:

        (1) Biodegradability: 80% degradable within 21 days per CEC L-32-A-94.

7. Confined space ventilation system procedure, where applicable.

8. Plan for upper wet well channel and lower wet well channel evacuation and re-entry. Location of readily visible location where plan will be posted on site.

9. Plan for when an anticipated and/or actual rain event brings water into the Inlet Facility during the course of work in accordance with Section 3.02.D. Plan shall include post-storm clean-up procedures within the upper wet well channel and lower wet well channel including provisions for disposal of debris.

10. Plan for diversion of dry weather and wet weather creek flow in accordance with Section 3.02.C.

11. Daily reports on construction progress corresponding to sequence of construction. Daily Reports shall include information obtained from the National Weather Service website for Austin/Camp Mabry for forecasted conditions.

1.07 QUALITY ASSURANCE

A. CONTRACTOR is responsible for all details necessary to properly perform the work defined herein, in accordance with the Contract Documents.

B. CONTRACTOR is responsible for all details necessary to properly protect its personnel and OWNER's personnel working in the areas adjacent to CONTRACTOR'S work area.

C. CONTRACTOR to exercise appropriate regulatory safety precautions throughout the performance of this work, to include precautions to avoid exhausting hazardous materials, personnel safety, and properly disposing of waste materials.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL SEQUENCE

A. This sequence of construction is a suggested procedure for performing the outlined work. CONTRACTOR remains solely responsible for preparation of a workable sequence of construction that meets the specifications.

B. CONTRACTOR shall minimize the amount of time on site until installation is ready to begin. CONTRACTOR shall coordinate work such that all major equipment items with long lead times shall have submittals approved by ENGINEER prior to CONTRACTOR mobilizing at the site. Reference Special Provision to Specification 700S, “Mobilization”.

C. All submittals required for the work in any particular work area must be approved by ENGINEER prior to starting construction in that work area.

D. All the construction work that will impede full operational performance of the Inlet Facility shall be completed before the date established in Contract Documents for Substantial Completion.

E. Prior to performing work in any confined spaces, CONTRACTOR to provide personnel access, ventilation and lighting adequate to comply with all local, state and federal confined space regulations for working in that specific environment. These provisions are to be coordinated with the OWNER to avoid or minimize impact on Inlet Facility operations.

F. CONTRACTOR shall test any temporary bypass pumping systems, prior to use.

G. CONTRACTOR shall be responsible for providing scaffolding support system as needed to access the work area and perform the work.

3.02 WET WELL CHANNEL SEQUENCE

A. General:

1. The Inlet Facility Pool receives stormwater from Waller Creek and an existing stormwater collection system on Red River Street. In addition, there is a constant stream flow in Waller Creek. The CONTRACTOR shall perform the work while the Inlet Facility is open to accept waters from Waller Creek and other local storm drains during a rain event. Temporary diversion and/or bypass pumping will need to be provided by the CONTRACTOR for dry weather stream flows and to include all measures to ensure that turbid water is not released into Waller Creek downstream of the work.

2. Coordinate with OWNER at least two (2) weeks in advance for schedule to isolate upper wet well channel and lower wet well channel in order to install multi-rake screen mechanisms, irrigation pumps and support structures within the Inlet Facility. Closing of channel isolation gates will be performed by OWNER. Contractor shall be aware that the Inlet Facility Pool will be filled by OWNER prior to a storm event and pass flow through all six (6) screen bays. See Section below regarding rain event response.

3. Contractor shall obtain approval of OWNER at least two (2) weeks in advance of all isolation systems prior to starting installation.

4. Work includes installation of multi-rake bar screen cleaning equipment in the upper wet well channel and the lower wet well channel, installation of debris monitoring level sensors for each screen, installation of an air quality monitoring system, and installation of two (2) pumps for the irrigation system without impeding the operations of the Inlet Facility in the event of a storm. CONTRACTOR to schedule the work to minimize bypass pumping and any interruption of Inlet Facility operations.

5. Bypass pumping and any interruption of Inlet Facility operations are to be coordinated with the OWNER at least two (2) weeks in advance.

6. The existing bridge crane systems are available for Contractor's use during construction to remove existing equipment and piping, and to transport new piping, valves, and equipment. If the Contractor chooses to use these systems, Contractor shall be responsible for inspection, operation, maintenance, and repairs during the use of these systems.

7. Access inside the Inlet Facility is available through existing roll-up doors which have an opening height of 11.5 feet.

B. Wet Well Channel Isolation

1. CONTRACTOR shall monitor weather reports and work with the OWNER to minimize the number of times the wet well channels need to be isolated and the duration of each event. Contractor shall make provision for the wet well channels to be operable overnight. The wet well channels shall not be isolated for more than twenty four (24) hours and shall not both be isolated at the same time If isolation is required in excess of 24 hours, Contractor shall install a temporary by-pass pumping system in accordance with Specification Section 01540, "Temporary Bypass Pumping". The CONTRACTOR shall make every effort to reduce the time it takes to complete the work within the empty wet well channel. Isolation of the wet well channels with the existing isolation gates will be performed by OWNER. Any additional isolation measures needed on the downstream side of the channels will be the responsibility of the CONTRACTOR.

2. All required equipment and materials to be present on site at least 24 hours before any isolation operations of the wet well channels. CONTRACTOR shall confirm all materials and equipment necessary to perform the work is on site. Failure to meet this requirement will cause the work to be rescheduled.

3. All equipment and materials will be required to be removed from the operating deck area at the end of each work day to allow Inlet Facility operation overnight in the event of a storm.

4. Following a storm, CONTRACTOR shall coordinate with OWNER to discuss scheduling around cleanup activities before work can re-start in the wet well channels.

C. Civil

1. Dry weather flows from Waller Creek entering the Inlet Pool are approximately 0.5 cubic feet per second (cfs). In addition to creek flow, there are dry weather flows from storm drains downstream of 14th Street.

2. After a rain event, wet weather flows from Waller Creek are expected to be approximately 3.0 cfs entering the Inlet Pool.

3. CONTRACTOR shall provide, install, and maintain all temporary diversion methods and creek/stormwater bypass pumping systems etc. necessary to safeguard its work area adequately to allow for completion of construction.

4. The CONTRACTOR shall immediately notify the OWNER of any accident or spill caused by the CONTRACTOR during the course of the work. The CONTRACTOR shall be responsible for all costs associated with the cleanup, disposal of materials, and remediation of the spill, including any fines, penalties, or other costs and damages imposed upon the OWNER by any agency or private party as a result of the accident/spill or improper discharge by the CONTRACTOR.

D. Rain Event Response

1. The work will take place in and around a natural waterway and CONTRACTOR shall be prepared to address the impacts to the work during a rain event that will impact the Waller Creek watershed.

2. A significant rain event for this Contract is defined as any event predicted by the National Weather Service for Austin/Camp Mabry which 24 hours in advance of the commencement of rain, the predicted amount is 1/4-inch of rainfall or more over a 24-hour period. However, the OWNER reserves the right to declare a significant rain event and the CONTRACTOR shall begin removal of personnel and equipment at the time requested by the OWNER.

3. CONTRACTOR shall check the National Weather Service website for Austin/Camp Mabry no later than 8:00 AM CST each day work is to be performed. Documentation of this activity shall be included in the daily report.

4. CONTRACTOR shall provide an estimated time to remove all personnel and equipment out of areas of potential inundation to above elevation 486 feet at the Inlet Facility. This shall be included in the daily activity report.

5. CONTRACTOR is responsible for monitoring weather to determine/anticipate a significant rain event. When an event is identified, CONTRACTOR shall notify the OWNER and then discuss if removal of all personnel and equipment from the wet well channels is required. If the OWNER determines a significant rain event is anticipated, the OWNER may require the CONTRACTOR to remove all personnel and equipment. CONTRACTOR shall coordinate with OWNER's staff to determine when access will be reinstated to the Inlet Facility and wet well channels. CONTRACTOR is fully responsible for any flood borne equipment and material damages and losses which was not properly removed from the Inlet Facility.

6. CONTRACTOR shall be aware that the working conditions may be different after a rain event. Prior to construction, the OWNER will dewater the wet well channels,

and the CONTRACTOR will clean the surface of the wet well channels. Following any subsequent rain event, there is potential for the wet well channels to be filled with debris. If clean up is needed to continue work, it shall be the responsibility of the CONTRACTOR. CONTRACTOR shall not move and/or stockpile mud or debris in any way that will impede conveyance of stormwater.

7. Throughout the duration of the construction contract, the CONTRACTOR will be responsible for removing and disposing any debris that is stuck on the wet well screens within 24 hours of a rain event.

E. Multi-rake Screen Installation

1. Isolation of the wet well channels is subject to forecast weather conditions and operation of the Inlet Facility. Consequently, CONTRACTOR must effectively utilize opportunities to access facilities when the wet well channels can be isolated. Reference Section 3.02.B for wet well channel isolation requirements.

2. Prior to start of fabrication of the multi-rake screen cleaning mechanisms, CONTRACTOR shall visit the site and define the following:

   a. Confirm all dimensions shown on construction plans adequately to facilitate fabrication of multi-rake screen cleaning mechanism. Dimensions include vertical dimensions necessary to define the full travel path of the mechanism. In addition, dimensions should include vertical clearance and horizontal limits of existing bridge crane if desired to be used by the CONTRACTOR. If this requires the wet well channels to be isolated and drained, schedule site visit to accommodate this requirement.

   b. Define all concrete, grating, and handrail demolition requirements required by construction contract drawings and multi-rake screen cleaning mechanism installation.

3. Based on dimensions obtained, prepare fabrication drawings for multi-rake screen cleaning mechanism. Provide fabrication drawings to Engineer for review. Fabrication drawings should include all mounting information. Drawings shall define provisions for potential field adjustments necessary for final installation.

4. Define Contractor’s proposed sequence of construction planned for installation of multi-rake screen cleaning mechanism in the upper and lower wet well channels. The proposed sequence of construction shall be defined to minimize the amount of time the upper and lower wet well channel must be isolated. Contractor’s Sequence of Construction shall address the following:

   a. Concrete, grating, and handrail demolition and construction to precede the installation of the multi-rake screen cleaning mechanisms.

   b. Installation of the multi-rake screen cleaning mechanism drive units in the upper and lower wet well channels.

   c. Installation of debris hoppers and structural support platforms and grating.

   d. Installation of electrical and instrumentation and controls.

5. When the upper and lower wet well channels are isolated, Contractor’s proposed sequence of construction shall address the following:

a. Installation of all support members and multi-rake screen cleaning mechanism components within the channel necessary for a complete installation.

b. Confirm all alignment and tolerances are within Manufacturer's recommendations.

c. Perform operational test of the multi-rake screen mechanism in a dry condition as identified in the Specification Section 11327, "Mechanical Screening Systems". Testing shall use simulated signals per electrical and I&C specifications. Confirm cleaning mechanisms operate per the Contract Documents prior to filling the wet well channels to perform the wet condition testing.

6. Perform operation test of the multi-rake screen mechanism in a wet condition as identified in the Specification Section 11327, "Mechanical Screening Systems". Testing shall use simulated signals per electrical and I&C specifications. Confirm cleaning mechanisms operate per the Contract Documents prior to starting testing with actual storm events per the Specifications.

F. Debris Monitoring Level Sensor Installation

1. Install debris monitoring sensors and associated appurtenances. Coordinate with multi-rake screen installation in the lower and upper wet well channels. Install electrical I&C for debris monitoring sensors operation.

2. Perform operational test of the debris monitoring level sensors per electrical and I&C specifications.

G. Air Monitoring Sensor Installation

1. Install air monitoring sensors and associated appurtenances. Coordinate with multi-rake screen installation in the lower wet well channel. Install electrical and I&C for air monitoring sensors operation.

2. Perform operational test of the air monitoring sensors per electrical and I&C specifications.

H. Irrigation Pump Installation

1. Install irrigation pumps and associated piping and appurtenances in parallel with multi-rake screen installation in the upper wet well channel.

2. Isolation of the upper wet well is subject to forecast weather conditions and operation of the Inlet Facility. Consequently, CONTRACTOR must effectively utilize opportunities to access facilities when the upper wet well can be isolated.

3. Prior to start of procurement of irrigation pumps, CONTRACTOR shall visit the site and define the following:

a. Confirm all dimensions shown on construction plans adequately to facilitate installation of irrigation pumps and associated piping. Dimensions include proposed piping alignment to avoid existing utilities and conduit within the Inlet Facility. If this requires the upper wet well to be isolated and drained, schedule site visit to accommodate this requirement.

b. Define all concrete, piping, and grating demolition requirements required by construction contract drawings and irrigation pumps and associated piping installation.

4. Based on dimensions obtained, prepare fabrication drawings for irrigation pumps and associated piping. Provide fabrication drawings to Engineer for review. Fabrication drawings should include all mounting information. Drawings shall define provisions for potential field adjustments necessary for final installation.

5. Define Contractor's proposed sequence of construction planned for installation of irrigation pumps and associated piping in the upper wet well. The proposed sequence of construction shall be defined to minimize the amount of time the upper wet well must be isolated. Contractor's Sequence of Construction shall address, at a minimum, the following:

   a. Concrete, piping, and grating demolition and construction to precede the installation of the irrigation pumps and associated piping.

   b. Installation of the irrigation skid and associated backwash piping in the existing upper wet well pipe trench.

   c. Installation of the irrigation pumps and associated piping in the upper wet well.

   d. Installation of irrigation skid discharge piping to connection point with the existing yard piping west of the Inlet Facility building and to existing yard hydrants on the operating deck.

   e. Installation of electrical and instrumentation and controls.

6. When the upper wet well is isolated, Contractor's proposed sequence of construction shall address, at a minimum, the following:

   a. Installation of all support members, piping, and irrigation pump components within the wet well necessary for a complete installation.

   b. Confirm all alignment and tolerances are within Manufacturer's recommendations.

7. Perform operation test of the irrigation pumps as identified in the Specification Section 11311, "Irrigation Pump Station". Testing shall use simulated signals per electrical and I&C specifications. Confirm pumps operate per the Contract Documents.

3.03 PREPARATION

A. Civil / Mechanical

1. CONTRACTOR shall provide, install, and maintain all temporary plugs, sand bags, cofferdams, etc. necessary to safeguard its work area adequately to permit construction completion of all identified facilities.

2. CONTRACTOR shall provide, install, and maintain all spill prevention and secondary containment measures throughout the project.

B. Electrical

1. CONTRACTOR shall protect existing electrical fixtures in its work area from its construction operations, and shall provide temporary lighting as required to facilitate its operations and to protect both CONTRACTOR's and OWNER's personnel.

3.04 RETURNING FACILITIES TO SERVICE

A. General

1. CONTRACTOR shall clean-up each work area prior to facilities manager placing facilities into service.

B. Mechanical

1. CONTRACTOR shall remove all temporary facilities, such as access, lighting, and ventilation system, immediately following the need for such temporary facilities.

C. Electrical

1. CONTRACTOR shall reinstate the existing electrical fixtures in its work area (previously protected to facilitate its work), and shall remove his temporary lighting facilities.

3.05 MEASUREMENT AND PAYMENT

No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for the Work of which this is a component part.

END OF SECTION

1. CONTRACTOR shall perform all layout work to transfer all controls for grades, lines, levels and measurements from a minimum of two reference points provided by OWNER. All survey work will be performed under the direct supervision of a Texas Registered Professional Land Surveyor (RPLS).

2. Within 5 work days of the Notice To Proceed date, or within 10 Working Days of initiating work based on the approved Schedule in a new area of the Project, the CONTRACTOR shall survey and stake the locations of all proposed improvements behind the curb and within the ROW (examples: manholes, storm inlets, fire hydrants, etc.), or any other improvements identified by the OWNER'S REPRESENTATIVE, for the purpose of identifying the nature and location of these improvements to the adjacent property owner(s). The OWNER'S REPRESENTATIVE will identify to the CONTRACTOR the improvements to be staked.

3. OWNER will not stake for construction and will not be on site for survey layout activities, except to perform quality control checks.

4. CONTRACTOR shall be required to set elevation hubs (blue tops) for subgrade and base course on centerline, at quarter points and curb lines or edge of pavement at intervals not exceeding 50 feet.

5. The construction plans will include horizontal and vertical control points. References to approved COA benchmarks used in establishing controls on the drawings will be provided by the Owner's E/A. In addition, on building projects and/or projects not built within an existing public ROW, a boundary survey will be supplied together with a legal description of the property and all easements where Work will take place.

6. CONTRACTOR shall submit construction staking layout sheets sealed by a Professional Engineer or Registered Professional Land Surveyor registered in the State of Texas. CONTRACTOR shall use a qualification based selection process consistent with the Professional Services Procurement Act, Chapter 2254.004 of the Texas Government Code, when securing the services of a Professional Engineer or Registered Professional Land Surveyor. It is a violation of State Law to solicit bids for the services of a Professional Engineer of Registered Professional Land Surveyor.

    6.1 Any discrepancies found with the construction documents' dimensional layout will be corrected. CONTRACTOR shall assure that the Owner's Representative and E/A are notified so that the appropriate actions are taken to correct the Contract drawings.

    6.2 All Work shall be done to the lines, grades and elevations indicated on the drawings. Information concerning basic horizontal and vertical control points are shown on the PLANS. These points shall be used as the datum basis under this Contract.

    6.3 All work to transfer all controls for grades, lines, levels, layout and measurements shall be performed under the supervision of a Texas Registered Professional Land Surveyor, provided by the CONTRACTOR. Such work shall conform to the standards for construction staking in the most recent edition of the Texas Society

of Professional Surveyors Manual of Practice for Land Surveying, Category 5, Sections 1-12 inclusive.

6.4 The offset centerline stakes will be set at no greater than fifty (50) foot intervals. References to lines and grades as established by the CONTRACTOR's surveyor shall be in reference to these stake lines. The CONTRACTOR is required to provide a sealed statement from their RPLS that the controls are correct and the site layout has been done by their professional staff.

6.5 The CONTRACTOR shall place grade stakes and submit construction staking layout sheets. The CONTRACTOR shall allow a minimum of ten (10) days after submission to the Owner's Representative for review of construction staking layout sheets. Construction staking layout sheets shall include, at a minimum, the information contained in the form included at the end of this section. No Work shall be performed without Owner's Representative review and return to CONTRACTOR of construction staking layout sheets. The Owner's Representative, E/A and the CONTRACTOR shall review the survey controls on the ground.

6.6 Prior to any excavation, the CONTRACTOR shall establish the elevation to top of ground at offset stakes at the distance deemed appropriate by the CONTRACTOR to preclude disturbance of offset stakes during construction.

6.7 The CONTRACTOR shall furnish, without charge, experienced personnel and such calibrated survey equipment, tools, stakes, and other materials that the Owner's Representative may require in establishing or checking control points, or in checking survey, layout, and measurement work performed by the CONTRACTOR.

6.8 The CONTRACTOR shall keep the Owner's Representative informed in a reasonable time in advance of the times and places at which they wishes to do work, so that any checking deemed necessary by the OWNER may be done with minimum inconvenience to the E/A and minimum delay to the CONTRACTOR. Surveying will be coordinated between the Owner's Representative and CONTRACTOR in a manner convenient to both.

6.9 During layout, CONTRACTOR shall field verify the elevation and alignment of all tie-in points to existing infrastructure. This work shall be performed sufficiently in advance of construction so that any conflicts may be resolved without delay. Any work done without being properly located may be ordered removed and replaced at the CONTRACTOR's expense.

6.10 The CONTRACTOR shall carefully preserve all monuments, benchmarks, reference points, and stakes. In case of the destruction thereof, the CONTRACTOR shall bear the cost of replacement and shall be responsible for any mistake or loss of time that may be caused. Permanent monuments or benchmarks, which must be removed or disturbed, shall be protected until properly referenced for relocation. The CONTRACTOR shall furnish materials and assistance for the proper replacement of such monuments or benchmarks.

6.11 The CONTRACTOR shall satisfy themselves before commencing work as to the meaning and correctness of all survey control stakes, marks, etc., and no claim will be entertained by the OWNER for or on account of any alleged inaccuracies, unless the CONTRACTOR notifies the OWNER in writing before commencing the affected Work.

7. As needed for necessary documentation of the work progress, the CONTRACTOR shall maintain and/or protect offset or survey staking for the duration of the project. Any re-staking required to meet this requirement shall be done at the CONTRACTOR'S expense.

8. This item is subsidiary to the work as a whole.

End See attached "Construction Staking Layout Sheet"

CONSTRUCTION STAKING LAYOUT SHEET

Project Name: _____ **Date:** _____
C.I.P. ID#: _____ **Instrument No.:** _____
Person Recording: _____ **Weather Conditions:** _____
Crew Members: _____
General Purpose & Scope of Survey: _____

STATION	B.S.	H.I.	F.S.	LEVEL LOOP ELEVATION	ROD READING	HUB ELEVATION AT STATION	(TARGET) (eg., pipe invert) ELEVATION	C - CUT OR F - FILL	% GRADE	NOTES: INDICATE WHETHER CENTERLINE HUB OR _____ FT. OFFSET HUB

DEFINITIONS

General: Basic Contract definitions are included in the General Conditions, Section 00700 included herein.

Approved: The term approved, when used in conjunction with the Owner's Representative's action on the CONTRACTOR'S submittals, applications, and requests, is limited to the Owner's Representative's duties and responsibilities as stated in the Conditions of the Contract. A stamp reading "No Exceptions Taken" shall have the same intent as "Approved".

Furnish: The term furnish means supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

Indicated: The term indicated refers to graphic representations, notes, or schedules on the Drawings, or other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the reference. There is no limitation on location.

Install: The term install describes operations at the Project site including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

Installer: An Installer is the CONTRACTOR or another entity engaged by the CONTRACTOR, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in operations they are engaged to perform.

Project Site: The space available to the CONTRACTOR for performing construction activities either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

Provide: The term provide means to furnish and install, complete and ready for the intended use.

Regulations: The term regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

Trades: Using terms such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.

INDUSTRY STANDARDS

Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.

Conflicting Requirements: Where compliance with two or more standards is specified and where the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer to the Owner's Representative for a decision before proceeding.

Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

Abbreviations and Names: Trade association names, titles of general standards, and names and titles of government agencies are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturer's Association
AAN	American Association of Nurserymen.
AASHTO	American Association of State Highway and Transportation Officials.
AATCC	American Association of Textile Chemists and Colorists
ACI	American Concrete Institute
ACIL	American Council of Independent Laboratories
ACPA	American Concrete Pipe Association
ADC	Air Diffusion Council
AFBMA	Anti-Friction Bearing Manufacturers Association
AGA	American Gas Association
AGC	Associated General Contractors of America
AGMA	American Gear Manufacturers Association
AHA	American Hardboard Association
AHAM	Association of Home Appliance Manufacturers
AI	Asphalt Institute
AIA	American Institute of Architects
AIHA	American Industrial Hygiene Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction.
ALCA	Associated Landscape Contractors of America
ALI	Associated Laboratories, Inc.
ALSC	American Lumber Standards Committee
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute.

AOAC	Association of Official Analytical Chemists
AOSA	Association of Official Seed Analysts
APA	American Plywood Association
API	American Petroleum Institute.
AREA	American Railroad Engineers Association
ARI	Air Conditioning and Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ASA	Acoustical Society of America
ASA	American Standards Association.
ASC	Adhesive and Sealant Council
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating & Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials.
AWCMA	American Window Covering Manufacturers Association
AWG	American Wire Gage
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWPB	American Wood Preservers Bureau
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Institute of America
BIFMA	Business and Institutional Furniture Manufacturers Association
CAGI	Compressed Air and Gas Institute
CAUS	Color Association of the United States
CBM	Certified Ballast Manufacturers
CCC	Carpet Cushion Council

CDA	Copper Development Association
CE	Corps of Engineers
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CISCA	Ceiling and Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CPSC	Consumer Product Safety Commission
CRI	Carpet and Rug Institute
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard of NBS (U.S. Dept. of Commerce)
CTI	Ceramic Tile Institute
DFPA	Douglas Fir Plywood Association
DHI	Door and Hardware Institute
DLPA	Decorative Laminate Products Association
DOC	U.S. Department of Commerce
DOT	Department of Transportation
ECSA	Exchange Carriers Standards Association
EIA	Electronic Industries Association
EIMA	Exterior Insulation Manufacturers Association
EJMA	Expansion Joint Manufacturers Association
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FGMA	Flat Glass Marketing Association
FHA	Federal Housing Administration
FM	Factory Mutual Research Organization
FS	Federal Specifications
FSC	Forest Stewardship Council
FTI	Facing Tile Institute
GA	Gypsum Association

GSA	General Services Administration
HEI	Heat Exchange Institute
HI	Hydronics Institute
H.I.	Hydraulic Institute
HMA	Hardwood Manufacturers Association
HPMA	Hardwood Plywood Manufacturers Association
IBD	Institute of Business Designers
ICEA	Insulated Cable Engineers Association, Inc.
IEEE	Institute of Electrical and Electronic Engineers, Inc.
IESNA	Illuminating Engineering Society of North American
IGCC	Insulating Glass Certification Council
ILI	Indiana Limestone Institute of America
IMSA	International Municipal Signal Association
IRI	Industrial Risk Insurers
ISA	Instrument Society of America
ITE	Institute of Transportation Engineers
LEED™	Leadership in Energy and Environmental Design
LIA	Lead Industries Association, Inc.
LPI	Lightning Protection Institute
MBMA	Metal Building Manufacturer's Association
MCAA	Mechanical Contractors Association of America
MFMA	Maple Flooring Manufacturers' Association
MIA	Marble Institute of America
ML/SFA	Metal Lath/Steel Framing Association
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
MUTCD	Texas Department of Transportation Manual on Uniform Traffic Control Devices
NAAMM	National Association of Architectural Metal Manufacturers
NAIMA	North American Insulation Manufacturers Association
NAPA	National Asphalt Pavement Association
NBFU	National Board of Fire Underwriters
NBGQA	National Building Granite Quarries Association

NBS	National Bureau of Standards (U.S. Dept. of Commerce)
NCMA	National Concrete Masonry Association
NCRPM	National Council on Radiation Protection and Measurements
NCSPA	National Corrugated Steel Pipe Association
NEC	National Electrical Code (Published by NFPA)
NECA	National Electrical Contractors Association
NEII	National Elevator Industry, Inc.
NEMA	National Electrical Manufacturers Association
NETA	International Electrical Testing Association
N.F.P.A.	National Forest Products Association
NFPA	National Fire Protection Association
NHLA	National Hardwood Lumber Association
NIST	National Institute of Standards and Technology
NLGA	National Lumber Grades Authority
NOFMA	National Oak Flooring Manufacturers Association
NPA	National Particleboard Association
NPCA	National Paint and Coatings Association
NRCA	National Roofing Contractors Association
NWMA	National Woodwork Manufacturers Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PDI	Plumbing and Drainage Institute
PE	Professional Engineer
REA	Rural Electrification Administration
RFCI	Resilient Floor Covering Institute
RMA	Rubber Manufacturing Association
RPLS	Registered Professional Land Surveyor
SDI	Steel Deck Institute
S.D.I.	Steel Door Institute

SFPA	Southern Forest Products Association
SGCC	Safety Glazing Certification Council
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPIB	Southern Pine Inspection Bureau
SPRI	Single Ply Roofing Institute
SSPC	Steel Structures Painting Council
SSPMA	Sump and Sewage Pump Manufacturers Association
SWI	Steel Window Institute
SWPA	Submersible Wastewater Pump Association
TCA	Tile Council of America
TEX TEST	TxDOT Laboratory Test
TIMA	Thermal Insulation Manufacturers Association
TPI	Truss Plate Institute
TxDOT	Texas Department of Transportation
UL	Underwriters Laboratory, Inc.
USDA	U. S. Department of Agriculture
USGBC	U. S. Green Building Council
USPS	U. S. Postal Service
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Wallcovering Manufacturers Association
WIC	Woodwork Institute of California
WLPDIA	Western Lath, Plaster, Drywall Industries Association
WRI	Wire Reinforcement Institute
WSC	Water Systems Council
WSFI	Wood and Synthetic Flooring Institute
WWPA	Western Wood Products Association
W.W.P.A.	Woven Wire Products Association

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Documents related to this section will include the construction drawings and general provisions of the Contract, including the General Conditions, Section 00700, Supplemental General Conditions, Section 00810, and other Division 1 requirements.

1.2 SUMMARY

A. This section describes the preconstruction conference and other Project related meetings which may be held on a routine schedule throughout the duration of the Project.

B. The CONTRACTOR, or his authorized representative(s), shall attend all Project related meetings as indicated herein. The CONTRACTOR's representatives, as a minimum, shall include his Project Manager and Superintendent. Other CONTRACTOR's representatives may attend Project related meetings; however, there shall be a maximum of four (4) CONTRACTOR's representatives at any one meeting unless the ENGINEER/ARCHITECT approves a larger number.

C. The CONTRACTOR shall provide all pertinent reports, copies of reports, etc., for each meeting as may be required by this or other sections of the Contract.

1.3 PARTNERING WORKSHOP

A. To complete this work most beneficially for all parties, the Owner desires to form a Partnering Team among the Owner, Engineer/Architect, Contractor, and Subcontractor(s). This relationship will draw on the strength of all parties to identify and achieve mutual goals. The objectives are effective and efficient contract performance, intended to achieve completion within budget, on schedule, and in accordance with the drawings and specifications.

B. The Owner will schedule a Partnering Workshop independent of or in conjunction with the Preconstruction Conference, to facilitate the project objectives. The partnering relationship will be multilateral in makeup and participation will be totally voluntary.

1.4 PRECONSTRUCTION CONFERENCE

A. Attendees

A preconstruction conference shall be held as soon after the award and execution of the Contract as possible and before any Work at the site is started. The conference will be held at a location selected by the Owner's Project Manager. The Owner's Project Manager shall prepare and distribute the meeting agenda, preside over the conference, and may distribute meeting minutes. The conference shall be attended by:

1. CONTRACTOR's Project Manager.
2. CONTRACTOR's Superintendent.
3. Any Subcontractors' and/or Suppliers' representatives whom the CONTRACTOR may desire to invite or whom the ENGINEER/ARCHITECT or OWNER may request to attend.
4. ENGINEER/ARCHITECT's representative.
5. OWNER's Project Manager.
6. OWNER's REPRESENTATIVE
7. OWNER's Sponsor Department Representative.

8. Representative from the City of Austin, Transportation Department if a traffic management plan is required.
9. Representative from the City of Austin, Watershed Protection and Development Review Department, Environmental Inspection Division, if site erosion / sedimentation controls are required.
10. Representative from the City of Austin, Transportation Department if utility coordination has occurred through the Austin Utility Location and Coordination Committee.
11. Representative from the City of Austin, Contract Management Department, Contract Administration Division, to discuss wage.
12. Representative from the City of Austin, Small and Minority Business Resources Department to discuss M/WBE compliance.

B. Meeting topics

The topics to be discussed may include, but will not be limited to, the following items:

1. Introduction of persons attending the meeting.
2. General project description, including length of contract and liquidated damages.
3. Key personnel associated with the construction (may include, but is not limited to the following):
   - CONTRACTOR's Project Manager
   - CONTRACTOR's Superintendent
   - OWNER's Project Manager
   - ENGINEER/ARCHITECT's representative
   - OWNER's Sponsor Department Representative.
   - Representatives of the various utilities.
4. Lines of communication and chains of command.
5. Wage and personnel records and reporting requirements.
6. Subcontractors and suppliers.
7. Submittal review and approval procedure. Submittals may include, but are not limited to the following:
   - Letter stating the name and qualifications of the CONTRACTOR's Superintendent
   - Letter(s) from the Subcontractor(s) listing their salaried specialists
   - If applicable, a letter designating the Registered Professional Land Surveyor
   - If applicable, a letter designating the Safety Representative (for general project safety) and the "Competent Person" for excavation safety
   - Excavation Safety Systems Plan
   - Schedule of Values
   - Schedule for submittals
   - Shop drawings
   - Construction schedule (The schedule shall indicate the phases of work in which subcontractors will be participating. Subcontractors shall be indicated by name.)
   - Payroll reports
   - Substitution of subcontractors
   - Non-use of asbestos materials affidavit
   - Appropriate safety training certificates for workers that will initially be on site

- Documentation for all workers initially on site who are governed by a prevailing wage classification as described in Section 00830.
- Construction Equipment Emissions Reduction Plan

8. Job and traffic safety.
9. Permits.
10. Utility coordination report.
11. Notification of property owners and other affected by the project
12. Job meetings.
13. Use of the site for construction, storage, staging, etc., and interrelationship with other contracts.
14. Equal opportunity requirements.
15. Laboratory testing of material requirements.
16. Inventory of materials stored on site provisions.
17. Progress estimate and payment procedure.
18. Posting of signs.
19. Project safety.
20. Prompt payment procedure.
21. Review of contract - addenda, supplementary general conditions, special provisions, special specifications, and other unique project items.
22. Other

1.5 JOB MEETINGS

A. General

Job meetings shall be held as deemed necessary by the ENGINEER/ARCHITECT or OWNER or as requested by the CONTRACTOR throughout the duration of the Project. The meetings shall be held at a location selected by or approved by the Owner's Representative. The OWNER's REPRESENTATIVE or CONTRACTOR, as agreed to, shall preside over the meeting and issue meeting minutes.

B. Attendees

Job meetings will be attended by the following:

1. CONTRACTOR's Project Manager, when requested to attend.
2. CONTRACTOR's Construction Superintendent.
3. Any subcontractors' and/or suppliers' representatives whom the CONTRACTOR may desire to invite or whom the ENGINEER/ARCHITECT or OWNER requests to attend.
4. OWNER's REPRESENTATIVE
5. ENGINEER/ARCHITECT's representative(s), if needed or required.
6. OWNER's PROJECT MANAGER, if needed or required
7. OWNER's Sponsor Department representative(s), if needed or required.

C. Meeting topics

The topics will include, but not necessarily be limited to, the following subjects:

1. Review of previous meetings' notes and update of pertinent information and Project status.
2. Identification and discussion of new job related construction problems. Such discussion will be toward resolving identified problems.
3. Review work accomplished to date and establish proposed construction activities for the upcoming week(s).
4. Discuss the status of or need for change orders.
5. Check of required bonds and insurance certificates (including Workers' Compensation Insurance verification for CONTRACTOR's, Subcontractor's, and Sub-Subcontractor's employees as stated in Section 00700, General Conditions, 5.2 Workers' Compensation).
6. Status of pay requests.
7. Work in progress.
8. Review and update construction schedule including three week look ahead.
9. Review of submittals schedule and status of submittals.
10. Status of SMBR Compliance Plan.
11. Status of Safety Training certificates for all new workers on project.
12. Other.

1.6 OTHER MEETINGS

Other meetings shall be held from time to time as may be requested by the CONTRACTOR, the ENGINEER/ARCHITECT, or the OWNER. The time and place of the meetings shall be as mutually agreed upon. The attendance at the meetings shall be as requested by the party requesting the meeting.

END

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

The Contractor prepares submittals. Drawings and general provisions of Contract, including Section 00700, "General Conditions"; Section 00810, "Supplemental General Conditions"; Division 1 requirements and City of Austin Technical Specifications and Special Provisions thereto, should be used as the related documents for this requirement.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:

1. Security plan.
2. Contractor's construction schedule.
3. Submittal schedule.
4. Shop drawings.
5. Product data.
6. Samples.
7. Quality assurance and quality control submittals, including calculations, mix designs and substantiating test results.

B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:

1. Permits.
2. Applications for Payment.
3. Performance and Payment bonds.
4. Insurance certificates.
5. Monthly Subcontractors expense report.
6. Non-use of asbestos affidavits

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 00700, "General Conditions"; Section 00810, "Supplemental General Conditions"; and/or Division 1, Section 01025, "Measurement and Payment" specifies requirements for submittal of the Schedule of Values.

2. Division 1, Section 01200, "Project Meetings" specifies requirements for submittal and distribution of meeting and conference minutes.

3. Section 00700, "General Conditions"; Section 00810, "Supplemental General Conditions"; and/or Division 1, Section 01700, "Contract Close-out" specifies requirements for submittal of Project Record Documents and warranties at project close-out.

4. Section 00700, "General Conditions" Article 6.2.4 specifies requirements for Substitutes and "Approved Equal" Items.

D. Technical Submittals: Technical information required to be submitted by the Standard Specifications, Special Provisions or Special Specifications.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 SUBMITTAL PROCEDURES

Contractor shall be responsible for the following:

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals or resubmittals concurrently.

    a. The E/A reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

3. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.

    a. Allow fourteen (14) calendar days for initial review. Allow additional time if the Engineer must delay processing to permit coordination with subsequent submittals.

    b. If an intermediate submittal is necessary, process the same as the initial submittal.

    c. Allow fourteen (14) calendar days for processing each resubmittal.

    d. No extension of Contract Time will be authorized because of failure to transmit submittals to the E/A sufficiently in advance of the Work to permit processing.

B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Provide a space approximately 4 inches by 5 inches (100 by 125 mm) on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.

2. Include the following information on the label for processing and recording action taken.

    a. Project name.
    b. Date.
    c. Name and address of the Contractor’s Engineer.
    d. Name and address of the Contractor.
    e. Name and address of the subcontractor.
    f. Name and address of the supplier.
    g. Name of the manufacturer.
    h. Number and title of appropriate Specification Section.
    i. Drawing number and detail references, as appropriate.

C. Number of Copies:

1. Two (2) copies of the proposed Construction schedule and subsequent revision are required.

2. Two (2) copies of the proposed Submittal schedule and subsequent revision are required.

3. Nine (9) copies of Shop Drawings, Product, Product Samples, Quality Assurance and Quality Control submittals are required.

D. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the E/A through the Owner's Representative using a transmittal form (An example Transmittal Form is provided at the end of this section). The E/A will not accept submittals received from sources other than the Contractor.

1. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

2. Number transmittals in sequence for each Series of the Specifications thus: x-xxx. The number after the dash indicates the Section of the Specifications, and the number before the dash is the sequence number of the transmittal. For example, the first item submitted related to Specification Item No. 506, "Manholes" would be labeled **1-506**, the second item submitted would be labeled **2-506**, etc. If the submittal item relates to a Special Provision or Special Specification, use **SP506** or **SS5061**, for example, to indicate the applicable Specification Section. Identify resubmittals with a letter of the alphabet following the original sequence number, using "A" for the first resubmittal, "B" for the second resubmittal, etc. For example, the first resubmittal of the second item submitted for Specification SP506 would be labeled **2A-SP506**.

3.2 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Construction Schedule: As described in Section 2.4.2 of Section 00700 "General Conditions", prepare a fully developed Contractor's construction schedule ("Baseline Schedule") using Microsoft Project© software unless otherwise approved by Owner's Representative. Submit Baseline Schedule prior to or at the preconstruction conference, and submit updated schedules as specified by the E/A, usually at each regularly scheduled Project Meeting and with each pay application.

1. Detail each significant construction activity and use a weekly timeframe for the schedule. Use the same breakdown of units of the Work as indicated in the "Schedule of Values."

2. With each update, revise task completion percentage and mark completed tasks.

3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.

4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically the critical path items and the sequences necessary for completion of related portions of the Work.

5. Indicate the phases of work in which subcontractors will be participating. Subcontractors shall be indicated by name.

6. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other schedules.

7. Indicate substantial completion in advance of the date established for Final Completion to allow time for the E/A's procedures necessary for certification of Substantial and Final Completion.

B. Work Stages: Indicate important stages of construction for each major portion of the Work, including submittal review, testing, and installation.

C. Cost Correlation: Within the Baseline Schedule, provide cost information indicating planned and actual costs. On the appropriate task line(s), show dollar volume of Work performed as of the dates used for preparation of applications for payment. Refer to Section 00700, "General Conditions", Article 14 Payment to Contractor and Completion for cost reporting and payment procedures.

D. Distribution: Following response to the Baseline Schedule submittal, distribute electronic copies to the E/A, subcontractors, suppliers, and other parties required to comply with scheduled dates. Keep a copy at the Project Site at all times.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

E. Schedule Updating: Revise the schedule after each meeting, event, or activity where revisions have been recognized or made and as requested by the E/A. Issue the updated schedule concurrently with the report of each meeting, or as requested by the E/A.

F. Contractor shall provide a three week look ahead schedule in a format acceptable to the Project Manager at each Job Meeting as required in 1200 1.5 C.

3.3 SUBMITTAL SCHEDULE

A. Concurrently with the development of the Contractor's Construction Schedule, prepare a complete schedule of submittals. Submit the initial Submittal Schedule along with the Construction Schedule, at, or prior to, the Pre-construction Conference.

1. Coordinate Submittal Schedule with the list of subcontractors, Schedule of Values, and the list of products as well as the Contractor's Construction Schedule.

2. Prepare the schedule in chronological order. Provide the following information:

a. Scheduled date for the first submittal.
b. Related Section number or Specification number.
c. Submittal category (Shop Drawings, Product Data, Calculations, Test Results, or Samples).
d. Name of the subcontractor.
e. Description of the part of the Work covered.
f. Scheduled date for resubmittal.
g. Scheduled date for completion of the E/A's review.

B. Contractor's schedule of submittals will be reviewed to verify that the list of submittals provided is all inclusive and the schedule is reasonable and realistic for delivery of the project. Owner will provide a response to the Contractor based on the assessment of the schedule of submittals.

C. Distribution: Upon Owner's agreement with the schedule of submittals, print and distribute copies to the Owner's Representative, E/A, Owner, subcontractors, suppliers, and other parties required to comply with submittal dates indicated. Keep copies at the Project Site at all times.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

D. Schedule Updating: Revise the schedule after each meeting or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting, or as requested by the E/A.

3.4 CONSTRUCTION SEQUENCE PLANS

The Contractor is required to submit construction sequence plans to the City at, or prior to, the pre-construction conference for approval. The Project shall be divided into phases according to the sequence of construction given in the Drawings and traffic control plans. The Contractor shall arrange his/her work schedule to complete all Work on each phase, including street repair, any valve casting or manhole adjustments, and street overlay before moving on to the next work area.

3.5 SHOP DRAWINGS

A. Submit newly prepared information drawn accurately to scale. Highlight, circle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

B. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:

1. Dimensions;
2. Identification of products and materials included by sheet and detail number;
3. Compliance with specified standards;
4. Notation of coordination requirements; and
5. Notation of dimensions established by field measurement.
6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 inches by 11 inches but no larger than 24 inches by 36 inches.
7. Do not use Shop Drawings without an appropriate stamp indicating action taken.

3.6 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, applicable certifications and performance curves.

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:

   a. Manufacturer's printed recommendations;
   b. Compliance with trade association standards;
   c. Compliance with recognized testing agency standards;
   d. Application of testing agency labels and seals;
   e. Notation of dimensions verified by field measurement; and
   f. Notation of coordination requirements.

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

3. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.

   a. Do not proceed with installation until a copy of the final submission of Product Data is in the Installer's possession.
   b. Do not permit use of unmarked copies of Product Data in connection with construction.

4. Potable Water, Reclaimed Water, and Wastewater Items or Projects: The Contractor shall submit descriptive information and evidence that the materials and equipment the Contractor proposes for incorporation into the Work is of the kind and quality that satisfies the specified functions and quality. **Austin Water Utility Standard Products Lists (SPL)** are a part of the Specifications. Contractors shall use products specified in the Contract Documents, listed on the SPLs, or approved by AWU through the process in Section 2.4.0 of the Utilities Criteria Manual. Products contained in the SPL cannot be substituted for items shown on the Drawings, or called for in the specifications, unless approved by the E/A in conjunction with the Austin Water Utility Standards Committee. **Unless otherwise specified,** products current at the time of solicitation shall be installed except where an updated List has been issued to remove a product because of quality or performance issues.

3.7 SAMPLES

A. Submit full-size, fully fabricated Samples cured and finished when specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.

1. Mount or display Samples in the manner to facilitate review of qualities indicated. Include the following:

   a. Specification Section number and reference;
   b. Generic description of the Sample;
   c. Sample source;
   d. Product name or name of the manufacturer;
   e. Compliance with recognized standards; and
   f. Availability and delivery time.

2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

   a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least 3 multiple units that show approximate limits of the variations.

   b. Refer to other Specification Sections for requirements of Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

   c. Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.

   d. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.

3. Maintain sets of Samples, as returned, at the Project Site, for quality comparisons throughout the course of construction.

   a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

   b. Sample sets may be used by Owner for final acceptance of the construction associated with each set.

B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.

3.8 QUALITY ASSURANCE AND QUALITY CONTROL SUBMITTALS

A. Submit quality assurance and quality control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, materials test results, field testing and inspection reports, and other quality-control submittals as required under other Sections of the Specifications.

B. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a certification from the manufacturer or responsible Engineer certifying compliance with specified requirements.

1. Signature: Certification shall be signed by an officer of the corporation or other individual authorized to sign documents on behalf of the company.

C. Calculations: When required in the technical specification, calculations shall be prepared and stamped by a Professional Engineer registered in the State of Texas.

D. Concrete, Controlled Low Strength Material, Asphalt Stabilized Base and Hot Mix Asphaltic Concrete Mix Designs and Substantiating Test Data: Requirements for submittal of mix designs and substantiating test data are specified in the applicable Technical Specification Section. Each separate batch plant supplying ASB, HMAC and/or concrete shall submit mix designs to the Owner’s Representative for review.

3.9 ENGINEER/ARCHITECT'S ACTION

A. Except for submittals, for the record, or for information where action and return is not required, the E/A will review each submittal, mark to indicate action taken, and return within the time frame specified in Paragraph 3.1.A.3.

1. Compliance with specified characteristics is the Contractor's responsibility.

B. Action Stamp: The E/A will stamp each submittal with a uniform, action stamp. The E/A will mark the stamp appropriately to indicate the action taken, as follows:

1. “Reviewed”: the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.

2. "Reviewed with Comments”: the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.

3. "Revise and Resubmit” or “Rejected": do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations and resubmit without delay. Repeat if necessary to obtain different action mark.

a. Do not use, or allow others to use, submittals marked "Revise and Resubmit" or “Rejected” at the Project Site or elsewhere where Work is in progress.

4. Other Action: Where a submittal is for information, or for record purposes, or for special processing, or for other activity, the E/A will return the submittal marked “Record Copy”, “Action Not Required” or “No Action Taken."

C. Unsolicited Submittals: The E/A will return unsolicited submittals to the sender without action.

3.10 PREPARATION AND SUBMITTAL OF CONSTRUCTION RECORD DRAWINGS

The Owner's Representative and the Contractor's Superintendent will each maintain a set of bluelines noting any changes in ink during construction of the Project. The Owner's Representative and the Contractor's Superintendent will compare bluelines at least weekly (at a time mutually acceptable to both) to exchange information and compare notes to ensure all items installed and changes are documented. The following is a recommended minimum of items to be noted:

GENERAL

1. Notes should be sufficiently clear to allow a draftsperson to easily make the necessary changes without the need for field checks and interpretation.
2. One complete set of Construction Record bluelines will be submitted prior to the final pay request and forwarded to the Owner.

STREET RECONSTRUCTION AND OVERLAY PROJECTS

1. Location, type, and quantity of all work added or deleted from the Project including repair areas, milled areas, sidewalk, ramps, curb and gutter, etc.
2. Deviations in street, sidewalk, curb and gutter location and grades from Drawings.

WATER/WASTEWATER PROJECTS

1. Type, name and model numbers of all valves (with # of turns to open/close), air release valves, drain and fire hydrants noted at locations installed.
2. Installed locations of all assignments, appurtenances and elevations which differ from those indicated on the Drawings.
3. Pipe manufacturer type and classification noted in sufficient detail to determine location and extent of each type or classification installed.
4. Modification to any standard or special details noted.
5. Location and description of pipe closures.
6. Thrust blocking locations and restrained pipe lengths, approximate dimensions and quantities noted.
7. Location, type and quantity of all addition and deletions.
8. Changes in grade.

The above list is not intended to be complete. Any information noted which could be used for future maintenance, location and construction projects is encouraged to be noted on the bluelines.

3.11 CONSTRUCTION DIARIES

The Contractor shall prepare a daily construction diary recording as a minimum the following information concerning events at the site and submit duplicate copies to the Owner's Representative at weekly intervals. The copies are to be signed by the project Superintendent as defined in Section 00700, Article 6.1.2.

1. Work performed;
2. Approximate count of Contractor's personnel, by classification, on the site;
3. List by classification, of all Subcontractors, personnel and any professionals on the site that day;
4. List of all equipment on the site by make and model;
5. High and low temperatures together with general weather conditions;
6. Start time and finish time of day's work;
7. Accidents and / or unusual events;
8. Meetings and significant decisions made;
9. Stoppages, delays, shortages and / or losses;
10. Meter readings and / or similar recordings;
11. Emergencies procedures that may have been needed;
12. Orders and requests of governing authorities;
13. Change Orders received and implemented;

14. Services connected and / or disconnected;
15. Installed equipment and / or system tests and / or startups and results;
16. Partial completions and / or occupancies; and
17. Date of substantial completion certified.

Shop Drawing Transmittal

Month XX, 2008

Transmittal No. _____
Previous Transmittal No. _____
Previous Submittal Date _____

City of Austin
Construction Inspection Division
Public Works Department
P.O. Box 1088
Austin, Texas 78767

Project Name: Austin Lakeside Drive

Attention: Owner's Representative

Enclosed are nine (9) copies of the following items for your review:

Item No.	Description	Submittal Type	Specification Section	Subcontractor/Supplier
1.	6" DI Pipe	Produce Data	510	ABC Company
2.	8" Resilient Seat Gate Valve	Product Data	511	DEF Company

NOTE: Item 1 above contains a deviation from the Specifications as indicated on the item

Submitted by: _____

XYZ Company
101 Ranch Road 2974
Austin, Texas 78759

END

PART 1 GENERAL

1.01 SUMMARY

A. Preliminary Progress Schedule: Submit no later than Pre-Construction Conference.

B. Submit the initial Submittal Schedule along with the Progress Schedule, at, or prior to, the Pre-Construction Conference.

C. Progress Schedule: Submit adjusted Progress Schedule or confirm validity of current schedule with each monthly Application for Payment in accordance with the General Conditions, and at such other times as necessary to reflect:
1. Progress of Work to within 5 working days prior to submission;
2. Changes in Work scope and activities modified since submission;
3. Delays in Submittals or resubmittals, deliveries, or Work;
4. Adjusted or modified sequences of Work;
5. Other identifiable changes; and
6. Revised projections of progress and completion.

D. Narrative Progress Report: Submit with each monthly submission of progress schedule.

E. Precedent to final payment, provide four copies of any Critical Path Method (CPM) type schedule utilized with certification that said schedule represents correctly the way the Work was performed.

F. Distribution: Following response to the initial schedule submittal, print and distribute copies to the ENGINEER, subcontractors, suppliers, and other parties required to comply with scheduled dates. Keep a copy at the Project Site at all times.
1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

1.02 SUBMITTAL SCHEDULE

A. Concurrently with the development of the Contractor's Construction Schedule, prepare a complete schedule of submittals. Submit the initial Submittal Schedule along with the Construction Schedule, at, or prior to, the Pre-construction Conference.
1. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products as well as the Progress Schedule.
2. Prepare the schedule in chronological order. Provide the following information:
   a. Scheduled date for the first submittal.
   b. Related Section number or Specification number.
   c. Submittal category (Shop Drawings, Product Data, Calculations, Test Results, or Samples).
   d. Name of the subcontractor.
   e. Description of the part of the Work covered.
   f. Scheduled date for resubmittal.
   g. Scheduled date for completion of the E/A’s review.

B. Distribution: Following OWNER’s response to the initial submittal, print and distribute copies to the Owner’s Representative, E/A, OWNER, subcontractors, suppliers, and other parties required to comply with submittal dates indicated. Keep copies at the Project Site at all times.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

1.03 PROGRESS SCHEDULE

A. General

1. Schedule(s) shall reflect Work logic sequences, restraints, delivery windows, review times, Contract Times, and Milestones set forth in the Agreement, and shall begin with the date of Notice to Proceed and conclude with the date of Final Completion.
2. The schedule requirement herein is the minimum required. CONTRACTOR may prepare a more sophisticated schedule if such will aid CONTRACTOR in execution and timely completion of Work.
3. Base schedule on standard 5-day work week.
4. Coordinate the Progress Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other schedules.
5. Indicate important stages of construction for each major portion of the Work, including submittal review, testing, and installation.
6. When the OWNER requests a specific sequence of work, that sequence of work is to be identified as a separate time line with its own critical path and schedule constraints.
7. Shop drawing submittals, including float for review time, are to be shown as specific activities on critical path items.
8. O&M Manual submissions are to be clearly shown as a separate task item on the schedule.
9. Indicate substantial completion in advance of the date established for Final Completion to allow time for the ENGINEER's procedures necessary for certification of Substantial and Final Completion.
10. Cost Correlation: At the head of the schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of Work performed as of the dates used for preparation of applications for payment. Refer to Section 00700, "General Conditions", Article 14 Payment to Contractor and Completion for cost reporting and payment procedures.
11. Use Microsoft Project latest version or a compatible and approved software.

B. Format

1. Critical Path Method (CPM) Schedule, on maximum 24-inch by 36-inch sheet size to include at least:
    a. Schedule to have critical path clearly shown on a calendar and the relationship between each task and calendar day indicated. The earliest time at which an activity may be started, the latest time at which an activity may be started, the earliest time which an activity may be finished, and the latest time at which an activity may be finished are to be clearly shown on the schedule. Format the schedule such that there is a one to one correspondence between schedule items and the Schedule of Values items. In addition submit an arrow diagram or precedence diagram for the initial schedule and each revision.
    b. Schedule to include those activities reasonably required to complete Work, including, but not limited to, subcontract Work, major equipment design, fabrication, factory testing, and delivery dates including required lead times for OWNER-furnished products, move-in and other preliminary activities, equipment and equipment system test and startup activities, Project closeout and cleanup, and specified Work sequences, constraints, and Milestones, including Substantial Completion date(s). Listings to be identified by Specification Section number.
    c. Identify:
        (i). horizontal time frame by year, month and week;

(ii) duration, early-start, and completion for each activity and sub-activity; and

(iii) critical activities and Project float.

d. Sub-schedules to further define critical portions of the Work.

e. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values".

f. Within each time bar, indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.

g. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically the critical path items and the sequences necessary for completion of related portions of the Work.

h. Indicate the phases of work in which subcontractors will be participating. Indicate Subcontractors by name.

2. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, with data for the entire construction period. Schedule is to be submitted as both a "hard" copy and a PC-compatible electronic copy on a CD-ROM.

C. If CONTRACTOR provides an accepted schedule with an early completion date, OWNER reserves the right to reduce Contract Times to match the early completion date by issuing a deductive Change Order at no change in Contract Price.

D. No partial payment requests will be processed unless the progress schedule has been submitted and/or updated and approved by the OWNER. No partial payments will be made unless the schedule has been approved by the OWNER.

E. Updating Progress Schedule: Adjust or confirm the Progress Schedule on a monthly basis. Revise the Progress Schedule after each meeting, event, or activity where revisions have been recognized or made. Issue the updated Progress Schedule at maximum intervals of 90 days, to reflect as nearly as possible the actual construction operations, show overall percent complete, projected and actual, and completion progress by listed activity and sub-activity.

1.04 NARRATIVE PROGRESS REPORT

A. Include, as a minimum:

1. Summary of Work completed during the past period between Narrative Progress Reports.
2. Work planned during the next period.
3. Explanation of differences between summary of Work completed and Work planned in previously submitted Narrative Progress Report.
4. Current and anticipated delaying factors and their estimated impact on other activities and completion Milestones.
5. Corrective action taken or proposed.

1.05 PROGRESS OF THE WORK

A. If CONTRACTOR fails to complete activity by its latest scheduled completion date and this failure may extend Contract Times (or Milestones), CONTRACTOR shall, within 7 days of such failure, submit a written statement as to how CONTRACTOR intends to correct nonperformance and return to the acceptable current progress schedule. Actions by CONTRACTOR to complete Work within Contract Times (or Milestones) will not be justification for adjustment to Contract Price or Contract Times.

1.06 - 1.11 (NOT USED)

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

Division 1 General Requirements

SUSTAINABLE CONSTRUCTION REQUIREMENTS

Section 01352

Non-Building Project using Baseline Sustainability Criteria

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section. The requirements may or may not include reference to sustainability.

Language in each section provides detailed guidelines to inform the Contractor of appropriate performance requirements for specific materials and products. All Sustainable design, materials, products, and methods must meet the specifications as written unless otherwise approved by the Architect or Engineer.

Related Sections include the following Division 1 Sections:

1. Section 01300 Submittals.
2. Section 01505 Construction and Demolition Waste Management and Disposal.

1.2 SUMMARY

A. This Section includes general requirements and procedures for compliance with certain Sustainable Construction requirements.

1. Some Sustainability requirements are dependent on material selections and may not be specifically identified as sustainability requirements. Compliance with requirements may be used as one criterion to evaluate substitution requests.

2. Additional Sustainability Construction requirements are dependent on design and other aspects of the Project that are not part of the Work of the Contract.

B. Related Sections: The contents of this Section are related to all Sections of these Specifications. Language in each section provides detailed guidelines to inform the Contractor of appropriate performance requirements for specific materials and products. All sustainable design materials, products, and methods must meet the specifications as written unless otherwise approved by the Architect or Engineer.

1.3 DEFINITIONS

A. Certificates of Chain-of-Custody: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria." Certificates shall include evidence that mill is certified for chain-of-custody by an FSC-accredited certification body.

B. Regionally Manufactured Materials: Materials that are manufactured within a radius of 500 miles (800 km) from the Project location. Manufacturing refers to the final assembly of components into the product that is installed at the Project site.

C. Regionally Extracted, Harvested, or Recovered Materials: Materials that are extracted, harvested or recovered and manufactured within a radius of 500 miles (800 km) from the Project site.

D. Recycled Content: The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer).

E. Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.

F. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.

E. Albedo: The ratio of the amount of light reflected from a material to the amount of light shone on the material ranging from 0 (black) to 1 (white). As defined by the USGBC, a high albedo material has a reflectance of at least 0.3. Albedo is also known as solar reflectance or reflectivity.

F. Heat island effect: When warmer temperatures (from 6 - 10°F) are experienced in urban landscapes as a result of solar energy retention on constructed surfaces. Principle surfaces that contribute to heat island effect include streets, sidewalks, parking lots, and buildings. Also called "Urban Heat Island Effect."

G. Post-consumer recycled content: The percentage (by weight) of a reclaimed waste material contained in a product. A reclaimed waste material (e.g., newspaper, magazines, beverage containers, etc.) has already served a purpose to a consumer and has been diverted or separated from waste stream for recycling.

H. Pre-Consumer Recycled Content: Previously referred to as Post-industrial recycled content. The percentage (by weight) of a waste material obtained from industrial processes that is contained in a product.

I. Recycled material: A material that would otherwise be destined for landfill disposal but is diverted or separated from the waste stream, reintroduced as material feedstock, and processed into marketed end products.

J. Reused Material: Any item that is salvaged or reused without significant reprocessing as in a recycling process.

K. Source reduction: Minimization of waste at the start of a process or activity so that there is a reduced amount of waste to recycle or dispose. Also called precycling.

L. Volatile Organic Compound (VOC): A large family of chemicals based on carbon and hydrogen structures that vaporize at room temperature. VOCs are one type of indoor air contaminant. They are found in many indoor sources including common construction products and materials. Although thousands have been identified in indoor air, only a few are well understood and regulated. VOCs are considered unhealthful to humans - some individual VOCs are known or suspected human carcinogens or irritants to the eyes, nose, and mucous membranes. When released, VOCs can contribute to the formation of ground level ozone and smog. Formaldehyde and toluene are two examples of VOCs commonly found in construction materials.

M. Xeriscape: Quality landscaping that conserves water and protects the environment through its employment of seven principles: planning and design; soil analysis; appropriate plant selection; practical turf areas; efficient irrigation; use of mulches; and appropriate maintenance.

1.4 SUSTAINABILITY OBJECTIVES/GOALS

The City of Austin is committed to sustainability and expects the Project to reflect this commitment. The specific Sustainable (Design & Construction) goals for this project include:

1. Protection of the environment.
2. Limiting construction site area and disturbance of natural habitat and protection of trees and vegetation.
3. Reduction of waste created by construction activity through Source Reduction.
4. Increasing the use of materials and products with recycled content.
5. Chemically safe construction materials and pest management.
6. Construction materials that use less energy and create less pollution in manufacture, delivery, installation, renovation, and demolition.

1.5 SUBMITTALS

A. ***General***: Submit additional Sustainability submittal requirements included in other sections of the Specifications.

B. ***Sustainability submittals*** are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated requirements.

C. ***Sustainable Construction Action Plans***: Provide preliminary submittals within 30 calendar days of date established for the Notice to Proceed indicating how the following requirements will be met.

1. Construction & Demolition Waste Management Plan complying with Division 1 Section 01505 "Construction Waste Management."
2. List of proposed salvaged and refurbished materials, identifying the source, and cost of each material.
3. List of proposed materials with recycled content, indicating cost, post consumer recycled content, and pre-consumer recycled content for each product having recycled content.
4. List of proposed regionally manufactured materials and regionally extracted, harvested, or recovered materials, identifying each regionally manufactured material and its source.
5. List of proposed certified wood products, indicating source, and cost of each product. Indicate total cost for wood-based materials used for Project, including non-rented temporary construction.

D. ***Sustainable Construction Progress Reports***: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with Action Plans for the following:

1. Waste reduction progress reports complying with Division 1 Section 01505 "Construction & Demolition Waste Management and Disposal."
2. Salvaged and refurbished materials.

E. ***Sustainability Documentation Submittals***:

1. Comply with Division 1 Section 01505 "Construction Waste Management."
2. Receipts for salvaged and refurbished materials used for Project, indicating sources.
3. Product Data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
4. Product Data indicating location of material manufacturer for regionally manufactured materials.

5. Product Data for rapidly renewable materials.

6. Documentation of lumber product/material qualifications:

a. Forest Stewardship Council chain-of-custody certificates documenting source of wood construction components and each point of purchase from forest from which the material was harvested to incorporation into the Project.

b. Certification of compliance with the Forest Stewardship Council "Principals and Criteria" for forest management.

c. Submit vendor/supplier invoices for each certified wood product containing product name, vendor name, product cost, certified wood percentage, Forest Stewardship Council chain-of-custody certification numbers on a line-item basis.

1.6 QUALITY ASSURANCE

A. Sustainability Coordinator: Engage a responsible person on the construction team who is familiar with Sustainable practices and procedures. The Coordinator may also serve as the Waste Management coordinator.

PART 2 – PRODUCTS

Provide and maximize to the greatest extent economically feasible, a combination of salvaged, refurbished, recycled, regional materials and certified wood within the scope of the project.

2.1 RECYCLED CONTENT OF MATERIALS

A. Provide construction materials with recycled content for a minimum of 10% of the total value of the project. Such that the sum of post-consumer recycled content plus one-half of the post-industrial is 10% of content of the materials in the project.

1. The cost of post-consumer recycled content of an item shall be determined by dividing the weight of post-consumer recycled content in the item by the total weight of the item and multiplying by the cost of the item.

2. The cost of post consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing the weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by the total weight of the item and multiplying by the cost of the item.

2.2 REGIONAL MATERIALS

A. Provide regionally manufactured materials with a goal of achieving 10 percent of construction materials (by cost).

2.3 CERTIFIED WOOD

A. Provide a minimum of 50 percent by cost of wood-based materials that are produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "Principles and Criteria for Forest Stewardship."

1. Wood-based materials include but are not limited to the following materials when made from made wood, engineered wood products, or wood-based panel products:

a. Miscellaneous carpentry.

b. Heavy timber construction.

c. Wood decking.

d. Landscape and streetscape materials.

e. Non-rented temporary construction, including bracing, concrete formwork, pedestrian barriers, and temporary protection.

PART 3 – EXECUTION

3.1 SITE DISTURBANCE

A. Special Site Practices:

1. Construction Activity Pollution Prevention: Comply with City of Austin standard requirements.

2. Protect and restore natural vegetation per division 1 Sections and plans.

3. Replace any removed or destroyed vegetation with equivalent species that are within City guidelines for native and adaptive plants.

4. Restrict construction activity only to defined site limits per plans and avoid activity and practices that would adversely affect environment, property, soils, vegetation and water courses.

3.2 CONSTRUCTION WASTE MANAGEMENT

A. Comply with Division 1 Section 1505 "Construction Waste Management."

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CONSTRUCTION EQUIPMENT EMISSIONS REDUCTION PLAN
Section 01353

1. GENERAL

1.1. RELATED DOCUMENTS

A. This Section applies to Drawings and all provisions of Contract.

1.2. SUMMARY – CONSTRUCTION EQUIPMENT EMISSIONS PLAN

A. The OWNER, as part of the Council Resolution No. 20100211-019, has decided to take steps to reduce emissions associated with construction process including Nitrogen Oxides (NOx), particulate matter and greenhouse gas. Construction activity is a source of large quantities of particulate matter and ozone forming Nitrogen Oxides that adversely affect the health of our community and the natural environment.

B. The CONTRACTOR shall employ practices and take actions that reduce emissions from NOx, particulate matter (black soot) and greenhouse gases resulting from activities associated with new construction and demolition Projects.

C. The CONTRACTOR shall maximize the use of equipment and vehicles with advanced emission controls in support of the City's goals, utilizing equipment that meets defined EPA emissions standards.

1.3. DEFINITIONS

A. "Construction Equipment" means equipment powered by an internal combustion engine and used for performing or otherwise advancing the Work on the Project, other than motor vehicles intended for use on public highways and registered pursuant to Section 502.002 of the Texas Transportation Code.

B. The list of applicable Construction Equipment includes, but is not limited to excavators, backhoes, loaders, bulldozers, graders, rock saws, generators, and other similar equipment.

C. "EPA" means the United States Environmental Protection Agency.

D. "Low-Use Equipment" means any piece of construction equipment which is used for less than ten (10) hours per week on site for a single construction contract.

E. "Greenhouse Gases" are emissions that absorb and emit radiation within the atmosphere. Greenhouse Gases can be one or a combination of, these gases: carbon dioxide, methane, nitrous oxide and three groups of fluorinated gases (sulfur hexafluoride, hydro fluorocarbons, and perfluorocarbons)

1.4. REQUIREMENTS – Not Used

1.5. SUBMITTALS

A. CONSTRUCTION EQUIPMENT EMISSIONS REDUCTION PLAN:

1. The CONTRACTOR agrees to prepare a draft Emissions Reduction Plan (referred to as PLAN) prior to start of construction. This PLAN shall include an inventory report

containing identifying data for each piece of equipment to be used on the worksite and shall include the following:

- Vehicle/Equipment: Make & Model Year
- Vehicle/Equipment: Engine Make & Model Year
- Vehicle/Equipment: Fuel Type
- Vehicle/Equipment: Expected gallons or hours used for project duration

a) The OWNER will provide Emissions Reduction Toolkit to help the CONTRACTOR in preparation of the PLAN and inventory.

2. The CONTRACTOR shall develop a list of strategies to be used in this Project in order to reduce emissions from NOx, particulate matter and greenhouse gas (CO_2 equivalent). Once prepared, the agreed upon strategies shall be incorporated into the PLAN. The PLAN will then be signed by the CONTRACTOR and made ready for implementation. Implementation progress will be reviewed once a month in regularly scheduled project progress meetings. The PLAN may be modified during construction if changes are made to the Project, but adjustments shall be approved by the OWNER prior to implementation.

3. This PLAN may be used by the Owner's Representative or Inspector to conduct site inspections and/or verify compliance with specification elements.

4. If additional equipment is brought on-site after construction begins, the Contractor shall provide this same inventory information to the Owner's Representative for the new equipment on or before the day it begins work on-site. All additional equipment shall conform to the PLAN.

5. Reports shall be provided for all equipment used on-site.

B. EQUIPMENT EMISSIONS CLOSEOUT DOCUMENTATION:

1. Submit the following prior to final payment:

a) Record of changes made to the original PLAN and reasons.

b) Provide a summary and documentation of strategies used and estimated reductions in fuel & emissions.

c) Provide documentation of amount and % of alternative fuel used.

2. PRODUCTS

Not used

3. EXECUTION

3.1. GENERAL

A. Implement the submitted PLAN. Provide personnel, documentation, equipment, signage, transportation, and other items as required to implement the PLAN during the entire duration of the Contract.

3.2. EQUIPMENT EMISSIONS PLAN IMPLEMENTATION

A. Plan Coordinator (Could be same as superintendent): Designate an on-site person responsible for instructing workers on the Owner's intent to reduce emissions, overseeing implementation and documenting results of the PLAN for the Project.

B. Plan Review: Review the PLAN in monthly progress meeting and include comments in the meeting notes.

C. Instruction: Provide on-site instructions to all subcontractors of emissions reduction methods to be used by all parties for the appropriate activities of the Project.

D. Discuss Owner's goals and requirements at the following meetings:

1. Pre-bid conference.

2. Pre-construction conference.

3. Progress meetings (monthly).

3.3 EQUIPMENT EMISSIONS REDUCTION TOOLKIT

A. Equipment Emissions Reduction Toolkit available at:

1. Website: (http://austintexas.gov/department/capital-improvement-program)

2. City of Austin Public Works Department, Project Management Division, One Texas Center, Suite 900

3. Construction Job Site Office (after contract award)

B. Equipment Emissions Reduction Toolkit consists of:

1. A list of Construction Equipment Emissions Reduction Strategies

2. EPA fuel savings calculator by idling reductions

3. Posting of Anti-idling signs

4. Memorandum of Agreement by Local Area Governments

5. Equipment Inventory Form

3.4 A LIST OF EQUIPMENT EMISSIONS REDUCTION STRATEGIES

The following are suggested emissions reduction strategies and references. As per the specification section 01353, 1.5 Submittals, the CONTRACTOR shall develop a list of strategies to be used in this Project at the start of construction.

C-1 Anti-Idling Strategies:

1. Implement and enforce anti-idling practices for all equipment and vehicles on and adjacent to the site and associated with the project. City will provide a construction site sign and stickers for vehicles and equipment. Add Hyperlink to COA Idling flyer location TBD

Also refer to:

https://www.nctcog.org/trans/quality/air/for-everyone/engine-off-north-texas

Another potential resource for the COA website on emission specifications:
https://www.tceq.texas.gov/airquality/mobilesource/vehicleidling.html

2. Limit all idling of project associated vehicles and equipment operations to five (5) minutes unless the idling is applicable to one or more of the following exceptions:

   a) Idling is being used for emergency response purposes;

   b) Idling is necessary for component of mechanical operation, maintenance, or diagnostic purposes; or

   c) Idling is for the health or safety of the equipment operator.

3. Provide education to all staff, vendors and subcontractors about emissions hazards and anti-idling practices and encourage use of EPA calculator for fuel savings.

4. To the extent possible, do not stop or idle haulage trucks directly under tree limbs and foliage overhanging the street along the haul route. Further avoid such damage from truck exhaust by means of exhaust diversion devices to redirect or diffuse exhaust from being directed in a concentrated manner to tree limbs and foliage.

5. Avoid vehicle loitering or queuing outside or inside the gates of the work area to minimize degradation of localized air quality.

   (http://austintexas.gov/airquality/)

C-2 Alternative Fuels:

6. Utilize **alternative fuels** including, Texas LED Compliant B20 (or higher) biodiesel, Compressed Natural Gas (CNG), propane and electric. (Refer to EPA Energy Policy Act for full list).

7. Avoid unnecessary fuel use by providing on-site fuelling for alternate fuels.

   (http://www.tceq.texas.gov/airquality/mobilesource/txled/cleandiesel.html)

   (http://www.eere.energy.gov/cleancities)

   (http://lonestarcfa.org)

C-3 Vehicle/Equipment Improvements:

8. It is recommended that CONTRACTOR takes advantage of the **Texas Emission Reduction Plan (TERP)** grant incentives to upgrade (replace or repower) vehicles with retrofitted emission reduction technologies. (http://www.tceq.texas.gov/airquality/terp/index.html) or (www.terpgrants.com)

9. Utilize **battery powered and/or solar powered equipment** where available. This strategy can be combined with anti-idling strategies by using this technology for sign boards. (evtransportal.org/dieselengineidlereduction.pdf)

10. Consider using voluntary and mandatory sections of the City of Chicago Clean Diesel Program related to https://www.chicago.gov/city/en/progs/env/clean-diesel.htmlfile:///C:/Users/user/Documents/Downloads/O2011-1418.pdf

11. Consider an air quality training section administered by a governmental entity to help comply with an updated

COA Construction Equipment Emission Reduction Plan by using the California Air Resources Board (CARB) training section in the link below:
https://ww2.arb.ca.gov/our-work/topics/construction-earthmoving-equipment

C-4 Maintenance Program:

1. Establish a preventative **maintenance program** addressing issues including but not limited to, fuel use, air emissions, tire pressure, smoke from exhaust and noise.
2. Make all efforts to **prevent oil/fuel spillage** on to site surfaces.

C-5 Resource Management:

3. Utilize equipment companies that are located closest to the construction site.
4. Store equipment on site during construction use or arrange for closest overnight storage including **temporary use of the Right of Way** if possible.
5. To the extent possible, CONTRACTOR shall maximize use of **local and regional materials** to reduce transportation emissions.
6. CONTRACTOR shall maximize **salvage and reuse** of appropriate on-site materials. (http://www.usgbc.org/ShowFile.aspx?DocumentID=1095)
7. To the greatest extent possible, stage equipment and vehicles away from, and minimize operation near, sensitive receptors including, but not limited to, operable windows, fresh air intakes, hospitals, schools, licensed day care facilities, residences and areas where people congregate.

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CONSTRUCTION PHOTOGRAPHY & VIDEOS
Section 01380

1. GENERAL

CONTRACTOR shall be responsible for the production of pre-construction, construction progress and post-construction photographs as provided herein. Owner's Representative may also designate additional subjects for photographs in addition to the general guidelines identified below.

2. QUALITY

All photographs must be produced by a competent photographer and shall be digital (6 Mega-Pixel) date-stamped color photography of commercial quality. All CONTRACTOR-generated photographs must be stored in a .jpeg file format. Each photograph shall be submitted in duplicate as two 3x5 prints with no more than 3 photos per page of professional quality enclosed in clear plastic sleeve within 3 tab folders. The prints shall be accompanied by digital date-stamped photographs in CD format or other format acceptable to the City. Each print shall be marked with the name and CIP ID number for the Contract, name of CONTRACTOR, description and location of view and identity of photographer.

Each photograph submittal must include a Photo Log that includes the name and CIP ID number of Contract, name of CONTRACTOR, the name of the photographer and company, photograph number, the date of the photograph and the filename that the camera assigns to the photo (e.g. MVC-001.jpg). In addition, appropriate descriptive information to properly identify the location of view must be entered into the Photo Log that includes a project drawing or sketch to assist in maintaining a concise project record (e.g. location of MH 5 - Line A or Sta. 2+00 - Line A or location of Sedimentation Basin 5, sludge pump A).

3. VIEWS AND QUANTITIES

3.1. PRE-CONSTRUCTION VIDEO
STREET, RIGHTS-OF-WAY OR WATER/WASTEWATER/STORMWATER PROJECTS

CONTRACTOR shall document by video, within the limits of construction, all pre-existing site conditions/elements as listed for the Pre-construction Photographs below. The video documentation shall provide a clear and continuous view of the project alignment showing all visible utilities and features within the limits of construction. The pre-construction video shall be in a format acceptable to the City and shall be shot prior to the occurrence of any site disturbance after Notice to Proceed. The pre-construction video shall be submitted within ten (10) calendar days of the Notice to Proceed.

3.2 PRE-CONSTRUCTION PHOTOGRAPHS
INFRASTRUCTURE FACILITIES (i.e. TREATMENT PLANTS, PUMP STATIONS, LIFT STATIONS, RESERVOIRS, ETC) OR BUILDING PROJECTS

All pre-construction photographs must be submitted prior to the CONTRACTOR or Subcontractor beginning any Work that may cause site disturbance and shall be submitted with the initial CONTRACTOR'S Pay Application. As a minimum, Pre-construction photographs must be taken of the following views:

- The entire construction site area (full width and length)
- All curb lines showing all pre-existing curb damage not called for replacement within the Work and shall include major cracks
- All driveways, steps, and curbs and curb ramps (both sides of street adjoining the project site)
- Fence and gate conditions
- Trees, ornamental shrubs, plantings/planter boxes and evidence of irrigation features
- Views of structures, both inside and adjacent to the project site and easements in areas where CONTRACTOR will be working within five (5) feet of said structure
- Other views as requested by the OWNER

3.3. CONSTRUCTION PROGRESS PHOTOGRAPHS
INFRASTRUCTURE FACILITIES (i.e. TREATMENT PLANTS, PUMP STATIONS, LIFT STATIONS, RESERVOIRS, ETC) OR BUILDING PROJECTS

Construction Progress photos must be taken at least twice per month.

One set of Construction progress photographs, as the work progresses, of the same views taken during pre-construction photography must be taken during the progress of the Work.

One set of the progress photos must be taken to depict the work accomplished during the month that includes:

- Work not yet covered up
- When MEP or building inspections are scheduled
- The beginning of installation of major items of equipment
- After installation of major items of equipment
- Other significant construction activities.

Both sets of photos shall be submitted monthly with the CONTRACTOR'S monthly progress payment application.

3.4 POST CONSTRUCTION PHOTOGRAPHS
Post-construction photographs must be taken of the same views taken during pre-construction photography to fully document the completed project. Post-construction photographs must be taken after cleanup and site restoration, and must be submitted with the final payment.

End

PART 1 GENERAL

1.01 SUMMARY

A. Testing Laboratory Services and CONTRACTOR's responsibilities related to those services.

1.02 (NOT USED)

1.03 GENERAL DESCRIPTION OF REQUIREMENTS

A. OWNER will contract with, and pay for, services of an independent testing laboratory to perform all inspections and testing identified in individual Specification Sections to assure quality of work. Testing procedures to be carried out in a professional manner, conforming to ASTM E329.

B. OWNER reserves the right to monitor materials incorporated into project and their placement by testing at OWNERS' expense. OWNER does not guarantee accuracy or validity of data nor does OWNER assume any responsibility for CONTRACTOR's interpretation of data. Materials or work which does not meet specifications to be removed or modified to meet the specifications.

C. Retesting for work rejected on basis of initial test results will be at expense of CONTRACTOR and extent of retesting to be determined by OWNER. OWNER may require additional testing for failing tests and may require two passing retests before acceptance by OWNER.

D. Inspection, sampling and testing requirements are set forth in, but not necessarily limited to, the TECHNICAL SPECIFICATIONS Sections.

E. Employment of testing laboratory does not relieve CONTRACTOR of obligation to perform work in accordance with requirements of Contract Documents.

F. CONTRACTOR to coordinate with OWNER's representative to schedule and monitor testing as required to provide timely results to avoid delay to the Work.

1.04 LABORATORY REPORTS

A. The OWNER will receive 3 copies, and the CONTRACTOR will receive 2 copies of laboratory reports from the testing laboratory. One of the CONTRACTOR's copies to remain at site field office for duration of project.

B. Reports of observations and tests to include, but not be limited to:
1. Date issued.
2. Project title and number.
3. Testing laboratory name and address.
4. Name and signature of technician and testing engineer.
5. Date of sampling.
6. Record of temperature and weather.
7. Date of test.
8. Identification of product and Specification Section.
9. Location of product.
10. Type of test.
11. Observations regarding compliance with Contract Documents.

C. Test reports which indicate non-conformance to be transmitted immediately via fax from the testing laboratory to the CONTRACTOR and OWNER.

1.05 LIMITS ON TESTING LABORATORY'S AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. Laboratory may not approve or accept any portion of the Work.

C. Laboratory may not assume any duties of CONTRACTOR.

D. Laboratory has no authority to stop the Work.

1.06 CONTRACTOR'S RESPONSIBILITIES

A. CONTRACTOR is responsible for providing materials which meet requirements indicated. For manufactured materials such as reinforcing steel, expansion joint materials, concrete pipe, cement, miscellaneous steel, cast iron materials, etc., CONTRACTOR is required to furnish a manufacturer's certificate that material meets requirements specified for this project.

B. Furnish product mix design together with applicable design work sheets and data to meet or exceed contract requirements.

C. Provide samples to laboratory in advance of their intended use to allow thorough examination and testing.

D. Notify OWNER, and laboratory 48 hours prior to expected time for operations requiring inspection and testing services. Notify ENGINEER if Specification Section requires the presence of the ENGINEER.

E. CONTRACTOR to coordinate with OWNER's representative to schedule and monitor testing as required to provide timely results and to avoid delay to the Work.

F. Cooperate with laboratory personnel in collecting samples to be tested or collected on site.

G. Provide access to the Work and to manufacturer's facilities.

H. Provide incidental labor and facilities for access to the Work to be tested; to obtain and handle samples at the site or at source of products to be tested; and to facilitate tests and inspections including storage and curing of test samples.

I. Correct work which is defective or which fails to conform to Contract. Corrective work is not to delay project or work of other contractors.

J. Patch all surfaces and areas disturbed by testing operations.

K. Arrange with laboratory and pay for:
   1. Retesting required for failed tests.
   2. Retesting for nonconforming Work.
   3. Additional sampling and tests requested by CONTRACTOR beyond specified requirements.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section includes general requirements for services to be provided by manufacturer's field representative, including training of OWNER's personnel and preparation of equipment installation reports.

1.02 DEFINITIONS

A. Person-Day: One person for 8 hours within regular CONTRACTOR working hours.

1.03 SUBMITTALS

A. Training Schedule: Submit not less than 21 days prior to start of equipment installation and revise as necessary for acceptance.

B. Preliminary Training Plan: Submit within 180 days after Notice to Proceed.

C. Final Training Plan: Submit after 60 days prior to first training session.

D. Training Materials:
   1. Submit written outlines of proposed training sessions not less than 21 days prior to scheduled training.
   2. Furnish complete training materials, to include operation and maintenance data as required in this Section not less than 7 days prior to training session.

E. Quality Control Submittals: When specified in the individual Specifications, submit "Equipment Installation Report".

1.04 QUALIFICATION OF MANUFACTURER'S REPRESENTATIVE

A. Authorized representative of the manufacturer, factory trained, and experienced in the technical applications, installation, operation, and maintenance of respective equipment, subsystem, or system. Representative subject to acceptance by OWNER. No substitute representatives will be allowed unless prior written approval by OWNER has been given.

1.05 FULFILLMENT OF SPECIFIED MINIMUM SERVICES

A. Where manufacturers' services are specified, furnish manufacturer's qualified representative for a sufficient period of time to perform all specified functions at no additional cost to OWNER.

B. Schedule manufacturer's onsite services to avoid conflicting with other onsite testing or other manufacturer's onsite services. Determine that all conditions necessary to allow successful testing have been met before scheduling services.

C. Only those days of service approved by ENGINEER will be credited to fulfill the specified minimum services.

D. If specified, manufacturer's onsite services to include at a minimum:
   1. Assistance during installation to include observation, guidance, instruction of CONTRACTOR's assembly, erection, installation or application procedures.

2. Inspection, checking, and adjustment as required for equipment to function as warranted by manufacturer and necessary to furnish written approval of installation.
3. Revisiting the site as required to correct problems and until installation and operation are acceptable to OWNER.
4. Resolution of assembly or installation problems attributable to, or associated with, respective manufacturer's products and systems.
5. Assistance during functional and performance testing and startup demonstration and until product acceptance by the OWNER.
6. Training of OWNER's personnel in the operation and maintenance of respective product as required herein.
7. Completion of equipment installation report with applicable certificates for proper installation and initial, interim, and final test or service.

1.06 TRAINING SCHEDULE

A. List specified equipment and systems with respective manufacturers that require training services of manufacturers' representatives and show:
   1. Estimated dates for installation completion.
   2. Estimated training dates to allow for multiple sessions when several shifts are involved.

B. Adjust training schedule to ensure training of appropriate personnel as deemed necessary by OWNER, and to allow full participation by manufacturers' representatives. Adjust schedule for interruptions in operability of equipment.

1.07 TRAINING PLAN

A. Preliminary Training Plan: If specified, and within 180 days after Notice of Award, submit for each proposed course:
   1. Title and objectives.
   2. Training schedule.
   3. Prerequisite training and experience of attendees.
   4. Recommended types of attendees (e.g., managers, engineers, operators, maintenance).
   5. Course description and outline of course content.
   6. Duration.
   7. Location (e.g., training center or site).
   8. Format (e.g., lecture, self-study, demonstration, hands-on).
   9. Instruction materials and equipment requirements.

B. Final Training Plan: Submit the following after training coordination meeting, if specified.
   1. Updated versions of course descriptions from preliminary training plan.
   2. Who will attend each course.
   3. Schedule of training courses including dates, durations, and locations of each class.
   4. Detailed course schedule for each day showing time allocated to each topic.
   5. Resumes of instructors providing the training.

1.08 TRAINING OWNER'S PERSONNEL

A. Furnish trained, articulate personnel to coordinate and expedite training, to be present during training coordination meetings with OWNER, and familiar with operation and maintenance manual information specified in Section 01730, "Operation and Maintenance Data".

B. Furnish manufacturers' representatives for detailed classroom and onsite hands-on training for OWNER's personnel on operation and maintenance of specified product (system, subsystem, component) and as may be required in applicable Specifications.

1. Manufacturer's Representative: Familiar with facility operation and maintenance requirements as well as with specified equipment.
2. Manufacturer's representative for training must be approved by the OWNER. Qualifications of manufacturer's representative must be submitted with the training schedule.
3. Training services must include some form of testing procedures to evaluate OWNER's personnel's understanding of the detailed training.
4. Training services must include a course and instructor evaluation questionnaire that must be completed by the trainees and submitted to the OWNER and the manufacturer.

C. Pre-Startup Training:
1. Coordinate training sessions with OWNER's operating personnel and manufacturers' representatives, and with submission of operation and maintenance manuals in accordance with Section 01730, "Operation and Maintenance Data".
2. Complete at least 14 days prior to actual startup.

D. Post-Startup Training: If required in Specifications, furnish and coordinate training of OWNER's operating personnel by respective manufacturer's representatives.

E. Taping of Training Sessions: Furnish audio and color video taping of pre-startup and post-startup instruction sessions, including manufacturer's representatives' hands-on equipment instruction and classroom sessions.
1. Use DVD format, suitable for playback on standard equipment available commercially in the United States.
2. Include only one manufacturer's training session on each DVD, or on a single track of a tape.
3. Video Training DVDs: Produced by a qualified, professional video production company, unless CONTRACTOR demonstrates satisfactory skill of other personnel as acceptable to OWNER.
4. Furnish OWNER with two complete sets of DVDs, and the original DVDs, fully indexed and cataloged with printed labels stating sessions and dates taped.
5. OWNER will furnish DVD playback equipment.

1.09 - 1.11 (NOT USED)

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 - 3.10 (NOT USED)

3.11 MEASUREMENT AND PAYMENT

No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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PART 1 - GENERAL

1.1 Related Documents:

Drawings and general provisions of Contract, including General Conditions, Section 00700,and Supplemental General Conditions, Section 00810, and Division 1 requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 Office at the Work Site (Job Shack)

During the performance of this Contract, CONTRACTOR shall maintain a suitable office at or near the site of the Work which shall be the headquarters of his superintendent. Any communication given to the superintendent or delivered to CONTRACTOR's office at the site of the Work in his absence shall be deemed to have been delivered to CONTRACTOR.

3.2 Water for Construction

All water required for and in connection with the Work to be performed shall be furnished by and at the expense of the CONTRACTOR through meters installed on hydrants, except for water used in the "disinfection of potable water lines" process per Specification 510.3(29). All water used in the disinfection process shall not be metered, but rather shall be measured by calculation. Such water use does not require a meter, but a double-check valve assembly is required when connecting to a fire hydrant or a City main. CONTRACTOR shall submit a written plan for the disinfection process for review and approval by OWNER prior to commencing Work. The written plan shall include the CONTRACTOR's plan for final flushing and discharge of chlorinated water, and shall specify the quantities of potable water that will be required for the procedure and dosage plan proposed by the CONTRACTOR. Water used in the disinfection process shall be supplied by the OWNER through hydrants or connection through a City main at no charge to the CONTRACTOR for the initial disinfection procedure up to the quantities agreed to in the written plan for the disinfection process. Should the initial disinfection procedure fail to produce acceptable bacteriological sample test results, the cost of water at standard rates used for subsequent disinfection procedures shall be the responsibility of the CONTRACTOR with quantities determined through calculations.

For all water required for and in connection with the Work to be performed other than for the disinfection process, water and meters will be available from OWNER at standard rates. All costs for obtaining a water meter shall be the responsibility of the CONTRACTOR. The CONTRACTOR shall contact the Austin Water Utility and arrange to pick up the meter. CONTRACTOR shall install a double-check valve assembly on the fire hydrant between the hydrant and the meter, to prevent backflow in the event of pressure failure. CONTRACTOR shall supply all necessary tools, hose and pipe, and shall make necessary arrangements for securing and transporting such water and shall take water in such a manner, and at such times, that will not produce a harmful drain or decrease of pressure in the OWNER's water system. It shall be the CONTRACTOR's responsibility to make arrangements with the Austin Water Utility for the metering and reporting of the amount of water used. Water shall not be used in a wasteful manner. Standard hydrant wrenches shall be used for opening and closing of fire hydrants. In no case shall pipe wrenches be used for this purpose. Temporary lines shall be removed when no longer required.

"If applicable, after the installation of the City of Austin's water meter(s) for the Project, the CONTRACTOR has the option to utilize the water available from this service at the

CONTRACTOR's expense. An adjustment to the Contract amount will be made by Change Order at the end of the Project for the costs incurred by the City of Austin for the water."

3.3 Telephone Service

CONTRACTOR shall make all necessary arrangements and pay all installation charges for telephone lines in his offices at the site and shall provide all telephone instruments. The telephone service shall be available to the Owner's Representative for toll free calls.

3.4 Sanitary Facilities

CONTRACTOR shall furnish temporary sanitary facilities at the site, as provided herein, for the needs of all construction workers and others performing Work or furnishing services on the Project.

Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one toilet shall be furnished for each 20 employees. CONTRACTOR shall enforce the use of such sanitary facilities by all personnel at the site.

3.5 Protection of Public and Private Property

CONTRACTOR shall protect, shore, brace, support and maintain all underground pipes, conduits, drains, and other underground construction uncovered or otherwise affected by the CONTRACTOR's operations. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, and other surface structures affected by construction operations, together with all sod and shrubs in yards, parkways, and medians, shall be restored to their original condition, whether within or outside the easement/right-of-way. All replacements shall be made with new materials.

CONTRACTOR shall be responsible for all damage to streets, roads, curbs, sidewalks, highways, shoulders, ditches, embankments, culverts, bridges, or other public or private property, which may be caused by transporting equipment, materials, or men to or from the Work, whether by him or his Subcontractors. CONTRACTOR shall make satisfactory and acceptable arrangements with the owner of, or the agency having jurisdiction over, the damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage.

All fire hydrants and water control valves shall be kept free from obstruction and available for use at all times.

3.6 Tree and Plant Protection

All trees and other vegetation which must be removed to perform the Work shall be removed and disposed of by the CONTRACTOR; however, no trees or cultured plants shall be unnecessarily removed unless their removal is indicated on the Drawings. All trees and plants not removed shall be protected against injury from construction operations.

No tree shall be removed outside of permanent easement(s), except where authorized by the E/A. Whenever practicable, CONTRACTOR shall tunnel beneath trees in yards and parking lots when on or near the line of trenching operations. Hand excavations shall be employed as necessary to prevent injury to trees. Care shall be taken with exposed roots, unearthed during construction, so that roots do not dehydrate causing tree damage.

Trees considered by the E/A to have any significant effect on construction operations are indicated on the Drawings and those which are to be preserved are so indicated.

CONTRACTOR shall take extra measures to protect trees designated to be preserved, using methods shown on the Drawings and as specified in Standard Specification Item No. 610S "Preservation of Trees and other Vegetation".

3.7 Security

CONTRACTOR shall be responsible for protection of the site, and all Work, materials, equipment, and existing facilities hereon, against vandals and other unauthorized persons.

No claim shall be made against OWNER by reason of any act of an employee or trespasser, and CONTRACTOR shall make good all damage to the OWNER's property resulting from CONTRACTOR's failure to provide security measures as specified.

Security measures shall be at least equal to those usually provided by OWNER to protect existing facilities during normal operations, and shall also include such additional security fencing, barricades, lighting, and other measures as required to protect the site. When required, the CONTRACTOR shall provide a security plan to the OWNER for review as to appropriateness of the security measures proposed.

3.8 Access Roads

CONTRACTOR shall establish and maintain temporary access roads to various parts of the site as required to complete the Project. Such roads shall be available for the use of all others performing Work or furnishing services in connection with the Project.

3.9 Parking

CONTRACTOR shall provide and maintain suitable parking areas for the use of all construction workers and others performing Work or furnishing services in connection with the Project, as required, to avoid any need for parking personal vehicles where they may interfere with public traffic, the OWNER's operations, or construction activities.

3.10 Dust Control

Dust Control during construction of this Project shall conform to Standard Specifications Item No. 220S, "Sprinkling for Dust Control". No direct payment will be made for dust control. Dust Control shall be considered subsidiary work relating to various Bid items of the Contract.

3.11 Temporary Drainage Provisions

CONTRACTOR shall be responsible for providing for the drainage of stormwater and such water as may be applied or discharged on the site in performance of the Work. CONTRACTOR shall obtain E/A approval for temporary drainage facilities which will handle, carry through, or divert around his Work all drainage flow, including storm flow and flows created by construction activity, to prevent silting of waterways or flooding damage to the property and adjacent property.

3.12 Erosion Control

CONTRACTOR shall prevent erosion of soil on the site and adjacent property resulting from his construction activities. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation, or other operations which will disturb the natural protection.

CONTRACTOR shall use controls found in "Environmental Criteria Manual" or developed from successful techniques elsewhere as approved by E/A.

3.13 Pollution Control

CONTRACTOR shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris and the substances resulting from construction activities. No sanitary wastes will be permitted to enter any drain or watercourse. No sediment, debris or other substance will be permitted to enter sanitary sewers and reasonable measures shall be taken by CONTRACTOR to prevent such materials from entering any drain or watercourse.

CONTRACTOR shall observe the rules and regulations of the State of Texas and agencies of the U.S. Government prohibiting the pollution of any lake, stream, river, or wetland by the dumping of any refuse, rubbish, dredge material, or debris therein.

CONTRACTOR is specifically cautioned that disposal of materials into any water of the State must conform to the requirements of the Texas Commission on Environmental Quality (TCEQ), and any applicable permit from the U.S. Army Corps of Engineers.

3.14 Noise Control

CONTRACTOR shall comply with the City of Austin's Noise Ordinance. CONTRACTOR shall take reasonable measures to avoid unnecessary noise. Such measures shall be appropriate for the normal ambient sound level in the area during working hours. All construction machinery and vehicles shall be equipped with practical sound-muffling devices, and operated in a manner to cause the least noise consistent with efficient performance of the Work.

3.15 CIP Sign

CONTRACTOR shall erect install and maintain CIP signs as specified. Signs shall be constructed in accordance with City Standard Specification Item No. 802S "Project Signs," as indicated on the Drawings.

3.16 Fences

All existing fences affected by the Work shall be maintained by the CONTRACTOR until completion of the Work. Fences which interfere with construction operations shall not be relocated or dismantled until written permission is obtained from the owner of the fence, and the period the fence may be left relocated or dismantled has been agreed upon. Where fences must be maintained across any construction easement, adequate gates shall be installed. Gates shall be kept closed and locked at all times when not in use.

Upon completion of the Work across any tract of land, CONTRACTOR shall restore all fences to preconstruction, or to a better, condition and to their preconstruction location.

3.17 Mail Boxes

CONTRACTOR shall remove, reset temporarily, and relocate permanently all mail boxes that are within construction site limits conforming to requirements of United States Postal Service. Mailboxes shall not be laid on the ground, but shall be temporarily reset the same day as removed. Payment for removing and resetting of mail boxes will not be paid for directly, but will be considered subsidiary to the various Bid items. Any damage to mail boxes or posts shall be the responsibility of the CONTRACTOR.

3.18 Emergency Facilities

Free access shall be maintained at all times to fire lanes and emergency and utility control facilities such as fire hydrants, fire alarm boxes, police call boxes, and utility valves, manholes, junction boxes, etc. In the event that it is necessary to make one of these facilities temporarily inaccessible, CONTRACTOR shall obtain approval of such action and schedule of Work from the OWNER. CONTRACTOR shall also provide at least 24 hours prior notice to the Fire Department, Police Department, and City Department governing the affected utility. The same Department(s) shall be promptly notified by the CONTRACTOR when such facilities are placed back in unobstructed service.

3.19 Notification of Owners

Unless otherwise indicated, the OWNER will notify property owners abutting the right-of-way of impending construction. The CONTRACTOR shall exercise diplomacy and tact with individual property owners.

3.20 Maintenance of Traffic

CONTRACTOR shall conduct his Work to interfere as little as possible with public travel, whether vehicular or pedestrian. Whenever it is necessary to cross, obstruct, or close roads, driveways, and walks whether public or private, the CONTRACTOR shall provide and maintain suitable safe bridges, detours or other temporary measures to accommodate

public and private travel, and shall provide reasonable notice to owners of private drives before interfering with them. Such maintenance of traffic will not be required when CONTRACTOR has obtained written permission from the owner and the tenant of the private property, or from the authority having jurisdiction over public property involved, to obstruct traffic at the designated point. A copy of the initial written permission shall be provided to the Owner's Representative.

Safety and conveyance of traffic shall be regarded as prime importance. Unless otherwise directed, all portions of streets associated with this Project shall be kept open and provided a dust free, smooth and comfortable ride to traffic. It shall be the responsibility of the CONTRACTOR to ensure that two-way traffic may safely bypass the construction site and that access is provided to abutting private property. In making open cut street crossings, the CONTRACTOR shall not block more than one-half of the street at one time without approval of the OWNER. Whenever possible, CONTRACTOR shall widen the shoulder on the opposite side to facilitate traffic control. Temporary surfacing shall be provided as necessary on shoulders.

Prior to beginning Work, CONTRACTOR shall designate, in writing, a competent person who will be responsible and available on the Project site, or in the immediate area, to ensure compliance with the traffic control plan. CONTRACTOR shall provide documentation to demonstrate the sufficient training in Traffic Control for his competent person. Owner will designate a qualified person to observe implementation and who will have authority to assure compliance with the traffic control plan.

The CONTRACTOR shall perform the necessary cleanup and finishing immediately after all or a portion of the Work is completed. When the Work includes paving operations, the entire site shall be kept clean to facilitate placement of required traffic control devices. Temporary and permanent striping lay-out shall be approved by the Transportation Department prior to placement, when included in the Work.

1. Detours

Where indicated on the traffic control plan CONTRACTOR shall erect and maintain detours around construction activities. Should CONTRACTOR desire to propose a detour, not already included in the traffic control plan, it shall be his responsibility to prepare a revised traffic control plan showing the detour, and obtain approval of the revised traffic control plan from the Transportation Department, prior to implementation of the detour. The Transportation Department has final authority as to the acceptability of any proposed revisions to the traffic control plan. The CONTRACTOR shall bear all costs for revising the traffic control plan and for maintaining the proposed detour.

2. Barricades and lights

CONTRACTOR shall place and maintain in good condition, standard barricades at each end of the Project and at other locations where traffic is rerouted or blocked from using regular traffic lanes. Barricades and warning signs shall be in accordance with the Texas Manual on Uniform Traffic Control Devices (MUTCD) and City of Austin Standard Specification Item No. 803S, "Barricades, Signs and Traffic Handling". Signs, barricades, and warning devices informing the public of construction features will be placed and maintained by the CONTRACTOR, who shall be solely responsible for their maintenance. The decision to use a particular device at a particular location as indicated in the traffic control plan or as determined by the CONTRACTOR, shall be the sole responsibility of the CONTRACTOR.

All open trenches and other excavations shall have suitable barricades, signs, and lights to provide adequate protection to the public. Obstructions, such as material piles and equipment shall be provided with similar warning signs and lights.

All barricades and obstructions shall be illuminated with warning lights from sunset to sunrise. Material storage and conduct of the Work on, or along side, public streets and highways shall cause a minimum obstruction and inconvenience of the traveling public.

3.21 Required Job Site Postings and Notices

CONTRACTOR shall post the following postings and notices in English and Spanish at one or more conspicuous locations on the job site. In the case of Projects with multiple sites, the notices and postings must be displayed at each site. In the case of Projects that do not have a job shack or other temporary facility on the site, CONTRACTOR shall post all notices on a temporary bulletin board. Other special conditions are noted below.

Required for all Projects	
Poster	Available at:
Baseline Schedule for Project identifying when all subcontractors will be used	N/A (as required under Section 00700, paragraph 2.4.2.1.)
Wage Rates as required under Section 00830.	Section 00830BC and/or Section 008300HH
City of Austin Wage Contact posters	Provided at Pre-Construction meeting (English and Spanish)
City of Austin Equal Employment Opportunity posters	http://austintexas.gov/department/wage-compliance (English and Spanish)
Texas Commission on Environmental Quality "Construction Site Notice" form, if applicable, as required or the required TPDES information	http://www.tceq.state.tx.us/assets/public/permitting/waterquality/attachments/stormwater/txr152d2.pdf (Option 1 – as required under Section 00810, 6.7.4.2 N/A (Option 2 – as required under Section 00810, 2.6.7.4.3)
OSHA poster "Job Safety and Health: It's the Law"	http://www.osha.gov/Publications/osha3165.pdf (English) http://www.osha.gov/Publications/osha3167.pdf (Spanish)
City of Austin Rest Break Ordinance Signs	http://austintexas.gov/department/wage-compliance (English and Spanish) As required to be posted in English and Spanish under Ordinance No. 20100729-047
Texas Payday Law Poster	http://www.twc.state.tx.us/ui/lablaw/ll10.pdf (English) http://www.twc.state.tx.us/ui/lablaw/ll10s.pdf (Spanish)
Texas Workers Compensation notice that the employer does or does not carry Workers Compensation insurance	Does not carry Workers Compensation Insurance: http://www.tdi.state.tx.us/forms/dwc/notice5.pdf (English) http://www.tdi.state.tx.us/forms/dwc/notice5s.pdf (Spanish) Does carry Workers Compensation Insurance: http://www.tdi.state.tx.us/forms/dwc/notice6.pdf (English) http://www.tdi.state.tx.us/forms/dwc/notice6s.pdf (Spanish)
TWC Employer's Notification of the Ombudsman Program to Employees	http://www.oiec.state.tx.us/documents/Employer_Notice_of_O.pdf (both versions)
DOL – The Uniformed Services Employment and Reemployment Rights Act (USERRA)	http://www.dol.gov/vets/programs/userra/USERRA_Private.pdf
EEOC Equal Employment Act and the Americans with Disabilities Act (ADA)	http://www.dol.gov/ofccp/regs/compliance/posters/pdf/eeopost.pdf (English) http://www.dol.gov/ofccp/regs/compliance/posters/pdf/eeosp.pdf

	(Spanish)
Fair Labor Standards Act (FLSA) Minimum Wage Poster	http://www.dol.gov/whd/regs/compliance/posters/flsa.htm (English) http://www.dol.gov/whd/regs/compliance/posters/flsaspan.htm (Spanish)
If applicable: Employee Rights for Workers with Disabilities/Special Minimum Wage Poster – Employment Standards	http://www.dol.gov/whd/regs/compliance/posters/disabc.pdf http://www.dol.gov/whd/regs/compliance/posters/disabspanc3p.pdf
"Your Rights Under the Family and Medical Leave Act (FLMA)"	http://www.dol.gov/whd/regs/compliance/posters/fmlaen.pdf (English) http://www.dol.gov/whd/regs/compliance/posters/fmlasp.pdf (Spanish)
Title VI Rights Poster	http://austintexas.gov/department/wage-compliance
Additional Postings Required for Federally Funded Projects	
"Employee Rights Under the Davis-Bacon Act"	http://www.dol.gov/whd/regs/compliance/posters/fedprojc.pdf (English) http://www.dol.gov/whd/regs/compliance/posters/davispan.pdf (Spanish)
Applies to USDOT/FHWA funded projects: "Notice of False Statements Concerning Highway Projects"	http://www.mdt.mt.gov/publications/docs/forms/dbe/eeo_board/false_statements.pdf (as required in Section 00810A Standard Federal-Aid Assurances)
Applies to USDOT/FHWA funded projects; "Contractors EEO Policy"	N/A (as required in Section 00810A Standard Federal-Aid Assurances)

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SECTION 01505

Non-Building Projects using Non-Building Baseline Sustainability Criteria (Minimal Waste)

PART 1 – GENERAL

1.1 Related Documents

1. Division 01 Section 01200 "Project Meetings"
2. Division 01 Section 01500 "Temporary Facilities"
3. Division 01 Section 01352 "Sustainable Construction Requirements".

1.2 SUMMARY

A. The Owner has established that the Project shall minimize the creation of construction and demolition waste on the Project site and shall recycle and/or salvage non-hazardous construction, demolition, and land clearing debris to divert waste from Landfills.

1. Contractor shall minimize factors that contribute to waste such as over packaging, improper storage, ordering error, poor planning, breakage, mishandling, and contamination.

2. Contractor shall reuse, salvage, or recycle as many of the non-hazardous waste materials as economically feasible.

3. All profits resulting from salvaging and recycling shall go to the Contractor.

4. Where there is little to no cost difference between recycling/salvaging and land-filling of items, the Contractor is directed to recycle/salvage.

B. Hazardous materials are an exception to this Section. Comply with applicable requirements of Local, State and Federal regulations.

C. This Section includes administrative and procedural requirements for recycling, salvaging and disposing of non-hazardous demolition and construction waste

1.3 REFERENCES

A. The standards listed below form a part of this Section to extent referenced. Standards are referred to in the text by basic reference only.

1. Sustainable Building Sourcebook – Austin Energy Green Building:www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Sourcebook/constructionWasteManagement.htm

2. Resource Exchange Network for Eliminating Waste (RENEW), TCEQ (MC-112), Biannual catalog lists materials available and wanted; serves Texas and surrounding states; lists are posted on the Internet: http://www.tceq.state.tx.us/assistance/P2Recycle/renew/renew.html

3. Recycle Texas Online, A service of the Texas Commission on Environmental Quality. Contains information on about 1000 businesses and local governments handling materials from Texas. Organizations' information is self-reported and listings are free of charge. www.tceq.state.tx.us/assistance/P2Recycle/rtol/rtol.html

4. "WasteSpec", Triangle J Council of Governments, Research Triangle Park, NC 27709, (919) 549-9390.

1.4 DEFINITIONS

A. Chemical Waste: Includes petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.

B. Clean: Untreated, unpainted, not contaminated with oils, solvents, caulk, or other materials.

C. Disposal: Acceptance of solid wastes at legally permitted and operating facility for the purposes of land-filling.

D. Diversion: Avoidance of demolition and construction waste sent for disposal to landfill or incineration. Diversion does not include using materials for landfill, alternate daily cover on landfills, or materials used as fuel in waste-to-energy processes.

E. Hazardous Waste: Byproducts of society that can pose a substantial or potential hazard to human health or the environment when improperly managed, and possessing at least 1 of 4 of the following characteristics, or appearing on a special Environmental Protection Agency (EPA) list.

1. Ignitability.

2. Corrosivity.

3. Reactivity.

4. Toxicity.

F. Landfill: Authorized land waste disposal site that is located to minimize waste pollution from runoff and leaching.

G. Recycling: The process of sorting, cleansing, treating, and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

H. Return: To give back reusable items or unused products to vendors for credit.

I. Reuse: A strategy to return materials to active use in the same or a related capacity.

J. Salvage: To remove a waste material from the Project site to another site for resale or reuse by others.

K. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become a waste.

L. Toxic: Poisonous to living beings either immediately or after a long period of exposure.

M. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

N. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes all materials removed from the Project site to be land-filled, recycled, or salvaged for reuse. Pallets, containers, packaging and packing materials in which construction products are delivered to the Project site are considered waste materials.

1.5 WASTE MANAGEMENT GOALS

A. The Owner has established that at least 50% of the "waste" materials produced as a result of the Work, shall be employed, salvaged, reused, or recycled in order to minimize the impact of construction and demolition waste on landfills and reducing disposal costs.

B. Contractor shall employ and encourage practices that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, State and local laws and regulations, pertaining to legal disposal of all construction waste materials.

D. Contractor shall recycle and divert materials for secondary uses whenever economically feasible.

E. Acceptable methods of diversion include:
Recycling, reuse and salvage
Donation to nonprofit organizations
Removal from jobsite by staff or subcontractors for use (not disposal)
Return to supplier
Sale to organizations or individuals

F. The Contractor shall develop a Construction and Demolition Waste Management Plan that results in end-of-Project rates for recycle and/or salvage of at least 50% of non-hazardous construction and demolition waste. The plan shall identify the materials to be diverted from disposal and define the materials to be separated on-site or off-site. Calculations can be done by weight or volume, but must be consistent throughout.

1.6 SUBMITTALS

A. ***Waste Management Plan:*** A Project-specific plan for the collection, transportation, and disposal of the waste generated at the construction site, shall be submitted for approval within 14 calendar days after date of the Notice to Proceed, or prior to any waste removal, whichever occurs first. The approved Plan shall be distributed to all subcontractors and the owner and will not relieve the Contractor's responsibility for compliance with applicable environmental regulations.

An example template is included as "Appendix A" to this section.

1. The Waste Management Plan shall include the following:

a. Identify each type of waste material produced as a result of the Work on the Project Site.

b. Identify each type and quantity of demolished and waste material intended to be recycled, salvaged or reused.

c. Identify material separation requirements.

e. Identify location of temporary on-Site storage for recycled and reused materials.

f. Identify final destination means of transportation for each recycled and reused material.

h. Identify the name/phone number of the Contractor's on-site coordinator of the Waste Management Plan.

i. Indicate permit or license and the location of the municipal solid waste landfills and other disposal area(s) to be used.

j. List of materials that cannot be recycled or reused.

B. ***CWM Closeout Documentation:*** Submit the following upon the completion of The Work and prior to final payment:

a. A Summary of Solid Waste Disposal and Diversion (refer example template "Appendix B") prepared and maintained through Project duration, demonstrating that 100% of all non-hazardous construction wastes were recycled, salvaged or disposed of properly and includes as a minimum the following information:

1. Dates
2. Materials Description
3. Materials Quantity
4. Indicate whether recycled, salvaged, reused or sent to landfill for disposal.
5. Name and location of accepting facility.
6. Destination

b. Copies of all receipts, manifests, weight tickets, and other documentation that identify all materials recycled, salvaged, land-filled or incinerated.

PART 2 - PRODUCTS

Not used

PART 3 – EXECUTION

3.1 GENERAL

A. Implement the Waste Management Plan as approved by the City of Austin Project Manager. Provide handling, containers, storage, signage, transportation, and other items as required to implement Waste Management Plan during the entire duration of the Contract.

B. Satisfy the requirements outlined in Subsection 1.5, Waste Management Goals.

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Plan Coordinator: Designate an on-site party (or parties) responsible for instructing workers, overseeing implementation and documenting results of the Waste Management Plan for the Project.

B. Plan Distribution: Provide copies of the Waste Management Plan to the Contractor's superintendent, each Subcontractor, the Owner, and the Engineer.

C. Meetings: Include Construction Waste Management in progress meetings to maintain the Plan for achieving the owners waste management goals:

D. Carefully order materials to avoid over supply.

E. Protect materials from contamination during handling, storage and transport to meet the requirements of the accepting facilities.

F. The Contractor shall assign and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, return and disposal. This area shall be kept neat and clean and clearly marked in order to avoid contamination of materials.

3.3 RECYCLING REQUIREMENTS

A. Materials: In general, the following types of construction waste materials generated during the course of this project that are not salvaged shall be recycled:

a. Asphalt concrete pavement.

b. Concrete materials.

c. Metals, including the following.

i. Banding straps.
ii. Reinforcing steel.
iii. Iron.
iv. Brass and bronze.
v. Lead.
vi. Extruded aluminum.
vii. Aluminum sheet.
viii. Stainless steel sheet.
ix. Steel studs.
x. Copper pipe.
xi. Steel pipe.
xii. Galvanized steel pipe.

d. Clean dimensional lumber.

e. Wood crates and pallets.

f. Glass and glass containers.

g. Plastics.

h. Plumbing fixtures.

i. Electrical conduit.

j. Electrical wiring.

k. Cardboard, paper, and packaging.

l. Beverage containers.

B. Methods: The following recycling methods, or a combination of, may be used.

1. On-site separation: Each material to be recycled shall be separated at the Project site and delivered to the recycling markets or directly from the Project site.

   a. If on-site separation method is used, designate a specific area or areas to facilitate separation of materials for potential reuse, salvage, recycling, and return.

   b. Maintain recycling and waste bin areas neat and clean and clearly marked, both in Spanish and in English, in order to avoid co-mingling of materials.

   c. Protect materials from contamination.

2. Off-site separation: Materials to be recycled are delivered unsorted from the Project site to a materials recovery facility or transfer station where recyclable materials are separated from other waste.

   a. Contractor shall verify that the entity responsible for the off-site separation has a market for all materials required to be recycled from the Project site.

   b. The same Submittals procedures shall apply.

c. Protect materials from contamination.

3.4 REUSE

A. Contractor is encouraged to reuse as many demolished and waste materials as possible.

B. Reuse of waste materials includes the following:

a. Salvaging materials scheduled for disposal.

b. Off-Site storage of waste materials for future reuse by Contractor on other projects.

c. Returning unused and reusable materials, packaging and pallets, to vendor.

e. Assemble designated reuse items in a single location safe from damage, for review and approval by the owner's representative.

3.5 SALVAGE

A. Salvage materials as identified on the Engineering Plans.

B. Salvage Guidelines:

1. The contractor shall salvage as many items as deemed economically possible, considering reduction of land filling fees and possible use by others.
2. Assemble potentially salvageable items in one area and donate or sell to the public after review by the City of Austin Project Manager.
3. All proceeds from the sale of salvaged items shall go to the contractor.

Appendix A. Sample Construction Waste Management Plan

Construction Waste Management Plan

Project:
Contractor:
Date:
Contact:
Phone:
Prepared by:

Diversion Goal: Recycle, reuse and/or salvage at least 50% *(by weight or volume) of land-clearing and construction waste*

I. Coordination and Training

a. Name of Contractor's representative responsible for CWM implementation & coordination.

b. Describe method(s) of waste recycling management – on-site and/or off-site.

c. Describe how Contractor's staff and subcontractors will be informed regarding proper recycling and separation procedures

d. Describe and/or show on an attached site map where the temporary waste material storage area(s) will be located, and how will contamination of separated waste materials will be prevented?

II. Waste Minimization

a. What waste minimization techniques will be employed during the construction phase?

_____
_____
_____
_____

b. Which employees and / or subcontractors will be involved with each technique?

_____
_____
_____
_____

III. Construction Waste Analysis (including site / land-clearing materials, as applicable)

a. ***Diverted Materials***: For each material anticipated to be reused or recycled (diverted from the landfill) to meet the minimum 50% diversion goal, provide information to complete the table below. (Note: Whenever possible, attempt to use or donate construction waste materials rather than recycling.)

Material or Item	Storage Method (roll-off, bin, area, on pallet, etc.)	Quantity estimate (no., linear ft., square ft., etc.)	Proposed Recipient

Add rows (or paper pages) as required

b. ***Landfill***: For construction phase trash and materials / items that will not be diverted, complete the following table:

Quantity estimate (weight or volume)	Number and size of roll offs anticipated	Proposed landfill site

Appendix B. Summary of Solid Waste Disposal and Diversion

Project name _____ Project Number _____
Contractor Name _____ License Number_____
Contractor Address_____

Solid Waste Material	**Recycled, Reused, salvaged or disposed**	**Date Material Disposed** or diverted	**Amount Disposed/ Diverted** (Ton or cubic yd.)	**Municipal Solid Waste Facility** (Name, address, Phone)	**Recycling/Reuse Facility** Name Address Phone	**Comment** (If disposed state why not diverted)
Vegetation						
Soil						
Trench spoils						
Rock						
Asphalt						
Concrete						
Metal						
Wood						
Debris						
Glass						
Trash						
Other						

Signature _____ Date _____

Page / of / total pages

END SECTION 01505

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Division 1 General Requirements

CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT PLAN
Section 01510

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for construction indoor air quality, including:

1. Construction Indoor Air Quality Management Purpose
2. Construction Indoor Air Quality Procedures
3. Construction Indoor Air Quality Submittals

B. This section includes references to the following external documents:

1. "IAQ Guidelines for Occupied Buildings Under Construction", Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), www.smacna.org, (703) 803-2980.

2. "ANSI/AHSRAE 52.2-1999: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size", American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), www.ashrae.org, (800) 527-4723.

1.3 PURPOSE

A. The intent of Construction IAQ (Indoor Air Quality) management is to reduce indoor air quality problems resulting from the construction process in order to help sustain the health and well-being of construction workers and building occupants.

1.4 PROCEDURES

A. The Contractor shall make every effort to reduce pollutants throughout the construction process in order to achieve compliance with IAQ testing maximum concentrations discussed below. The most significant method for achieving success is through source control, that is:

1. Install products and materials that are low- or zero-VOC, do not contain added formaldehyde, and are free of particulates

2. Request in-factory flush-out from manufacturers wherever possible, to flush out pollutants before products arrive at the site

B. The Contractor shall adopt an IAQ management plan to protect the HVAC system during construction, control pollutant sources, and interrupt contamination pathways.

C. Contractor shall sequence the installation of materials to avoid contamination of absorptive materials such as insulation, carpeting, ceiling tile, and gypsum wallboard.

D. Temporary HVAC units (independent of permanent ductwork and distribution systems) are recommended as the optimal method for achieving the Construction IAQ requirements. This allows permanent HVAC equipment to be fully protected. If contractor is utilizing permanent HVAC equipment for fresh air, heating, or cooling during construction, all air intakes shall be protected from incoming construction debris. Contractor shall use filtration media in all permanent air handling equipment during construction, and replace this media immediately before occupancy.

1. Regularly occupied spaces: Filtration media during and after construction shall have a Minimum Efficiency Reporting Value (MERV) of 13 as determined by ANSI/ASHRAE 52.2-1999. Obtain a diagram from MEP Engineer indicating location of all regularly occupied spaces.

2. All other spaces: Filtration media during and after construction shall have a Minimum Efficiency Reporting Value (MERV) of 8 as determined by ANSI/ASHRAE 52.2- 1999.

E. The Contractor shall employ Green Housekeeping methods wherever practicable.

1. Use non-toxic cleaners per Green Seal: http://www.greenseal.org/

2. Conserve energy by shutting off lights and HVAC in all areas except those currently being cleaned.

1.5 SUBMITTALS

A. With first Application for Payment, the General Contractor is to submit a draft Construction IAQ Management Plan. Architect will return plan with revisions or approval, to be resubmitted as many times as necessary for Architect's final approval. The plan shall be divided into 6 parts, addressing each of the following topics per "IAQ Guidelines for Occupied Buildings Under Construction", Sheet Metal and Air Conditioning Contractors' National Association (SMACNA); http://www.smacna.org/ ; (703) 803-2980. The plan shall also include requirements described in "Procedures" above.

1. HVAC protection
2. Source Control
3. Pathway Interruption
4. Housekeeping
5. Filter Maintenance Schedule
6. Scheduling

B. With subsequent Applications for Payment, the General Contractor is to submit documentation of IAQ procedures as follows:

1. Provide cut sheets of filtration media used during construction with MERV values highlighted (per ANSI/ASHRAE 52.2-1999). Fresh clean filters must be installed immediately prior to occupancy.

END

SECTION 01540

TEMPORARY BYPASS PUMPING

PART 1 – GENERAL

1.01 SUMMARY

A. This special specification governs temporary by-pass pumping for the purpose of diverting existing dry weather creek flow and pumped flow through the Waller Creek Inlet Facility around the work area for the duration of the work. Temporary bypass pumping will be required if dry weather creek flow and pumped flow to the Upper and Lower Wet Well Channels cannot be reinstated at the end of each day. The temporary bypass should not cause service or flow interruption for the Inlet Facility channels on which work is performed. Temporary by-pass pumping system shall have sufficient capacity to convey dry weather creek flow and pumped flows as identified by the Owner.

B. The work covered by this speciation consists of furnishing all labor, supervision, tools, equipment, appliances, and materials to perform all operations in connection with pumping of dry weather creek flow and pumped flows around channels where the work is being performed. The purpose of temporary by-pass pumping is to allow water to recirculate through the Waller Creek Inlet Facility. The Contractor shall coordinate with Operations staff on when by-pass pumping is needed to maintain proper recirculation.

1.02 NOT USED

1.03 NOT USED

1.04 DEFINITIONS

A. Temporary by-pass pumping is the installation and operation of bulkheads, plugs, hoses, piping, and pumps to maintain dry weather creek flow and pumped flow and prevent backup and overflow.

B. Temporary by-pass pumping provides continuous recirculation through the Inlet Facility while maintenance or construction operations are in progress by diverting flow when necessary around the construction location and pumping it downstream of the channel.

1.05 SYSTEM DESCRIPTION

A. It is the sole responsibility of the CONTRACTOR to locate and identify all existing channel inlets and services and to provide any and all labor, material, equipment, techniques and methods to temporary bypass pump as necessary for their construction methods and to monitor the effectiveness of this installed system and its effect on adjacent facilities.

B. Operate, maintain and modify the system(s) as required to conform to this specification. Upon completion of the Construction, CONTRACTOR shall remove the system(s).

C. Assume sole responsibility for temporary bypass pumping systems and for all loss or damage resulting from partial or complete failure of protective measures and any spills or resultant damage caused by his operation.

1.06 SUBMITTALS

A. Submittals: Comply with Specification Section 01300 “Submittals.”

B. The normal practice will be for the Contractor to isolate flow to the channels during the work day and return the channel to service to allow flow to pass at the end of the work day. If the channels will need to be isolated for more than twenty four (24) hours, Contractor shall setup temporary by-pass pumping at the beginning of each work day and pump around to allow for the day’s screen installation construction activities. With normal practice, the preferred suction point for temporary by-pass pumping will be at a point downstream of the isolation gate and upstream of the proposed screen installation. Discharge of the temporary by-pass must be downstream of the proposed screen installation within the channel. Contractor shall provide isolation to prevent bypass discharge from surcharging into the work area.

C. The Contractor shall provide a written description and plan/sketch for implementation and sequencing of by-pass pumping for review and approval of the Owner prior to installation of the by-pass system. The plan shall include sufficient detail to show the location, number and size of pumps, the number, location, size and type of hoses and/or rigid piping, and the location of the downstream discharge. Show any special features where pipes or hoses cross access paths. A plan for each channel around which flows are being by-passed is required. The plan shall include but not be limited to details of the following:

1. Project information including the project name, location, and permit number (from plan cover sheet).
2. Contact information for general contractor/submitting entity shall include the company name, contact person (24 hrs/day), phone number(s), and fax number.
3. Staging areas for pumps including a schematic showing the arrangement and layout of the pumping and by-passing facilities at various stages in the work.
4. Channel isolation method and types of isolation.
5. Calculations for selection of by-pass pump and pipe size(s) based on dry weather creek flows and pumped flows.
6. Length, size, material, location, and method of installation of suction piping.
7. Length, size, material, location, and method of installation of discharge hose.
8. Pump manufacturer model and pump curve.
9. Calculations of static lift, friction losses, and flow velocity, (pump curves showing pump operating range shall be submitted).
10. Downstream discharge plan.
11. Method of protecting structures from erosion, damage, and unauthorized entry.
12. Method of noise control for each pump and expected decibel levels.
13. Any temporary pipe supports and anchoring, if required.

1.07 QUALITY ASSURANCE

A. Service Provider Manufacturer: Pumps to be manufactured by acceptable manufacturers. Products of equal quality by other manufacturers will be considered, subject to review of written submittal that includes product data and a detailed list of features that deviate from design shown.

1.08 – 1.11 NOT USED

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Godwin (Xylem) pumps, Pioneer Pumps, Gorman-Rupp, or equal

2.02 MATERIALS / CONSTRUCTION

A. The pump and by-pass pumping lines shall be of adequate capacity and size to handle dry weather flows and pumped flows as defined by the Owner. All piping, joints, and accessories shall be designed to withstand at least twice the maximum system pressure, or a minimum of 50 psi, whichever is greater.

B. Heavy wall discharge hose shall be used. Four-inch and six-inch diameter discharge hose shall be capable of limited traffic driving over the hose for situations where the hose crosses a driveway. Pumps shall be self-priming or submersible, in good working order, with a working pressure gauge on the discharge. A back-up pump of the same capacity as the primary pump shall be maintained on site at all times to be used in the event that the primary pump fails.

C. Pumping between the hours 9:00 p.m. to 8:00 a.m. shall use sound attenuated pumps as the primary pumps. The back-up pump does not have to be sound attenuated and may be used as the primary pump between the hours of 8:00 a.m. and 9:00 p.m. Sound attenuated pumps shall reduce noise generated by the equipment to a maximum of 70 dBA when measured 30 feet from the pump.

D. Any water back-ups and/or overflows as the result of inadequate equipment are the responsibility of the Contractor.

E. Pipe for aerial crossing shall be self-supporting by design, or shall be furnished with a temporary support structure capable of supporting the weight of the pipe when filled with water for the duration of the project without significant deflection.

F. Pumps shall be self-priming or submersible electric, solids-handling, non-clog units in good working order, with a working pressure gauge on the discharge. Pumps should be designed to withstand dry running for long periods of time. Contractor shall provide necessary start/stop controls for each pump.

G. The Contractor shall be required to have all materials, equipment, and labor necessary to complete the screen installation work on the job site prior to isolating the channel and beginning temporary by-pass pumping operations.

H. The Contractor shall provide protection for the bypass system, including but not limited to pumps, pipe, fittings, piping connections, and ancillary equipment. Materials used for temporary bypass pumping shall be appropriate for the intended operational conditions and service. Protection of temporary bypass piping shall be provided by positive protection methods, including but not limited to burial.

2.03 – 2.04 NOT USED

PART 3 – EXECUTION

3.01 GENERAL

A. The Contractor shall be responsible for the design, installation, and operation the temporary by-pass system. The Contractor shall employ the services of a Vendor who specializes in the design and operation of temporary bypass systems. Field-verify channel flow rate and by-pass pumping requirements prior to submitting proposed pumping method for review, if necessary.

B. Locate existing utilities in the area and locate by-pass pipelines so as to minimize disturbance to existing utilities. Contractor shall be responsible for protecting existing

utilities from damage; and for the costs of repairing any damage to existing utilities or relocating existing utilities, including permits.

3.02 NOT USED

3.03 ERECTION, INSTALLATION, AND APPLICATION INSTRUCTIONS

A. The Contractor's efforts shall maintain flow to allow for recirculation in the Inlet Facility. The Contractor shall take all necessary steps to prevent flooding of public or private property. Maintaining flow inside the existing channel at the end of each work day is preferred.

B. Any time the temporary by-pass pump(s) are operating, an experienced operator shall be on site to monitor the operation: adjust pump speed, valves, etc.; maintain and make minor repairs to the system; and report problems.

C. Where work requires temporary by-passing beyond working hours, the Contractor shall operate by-pass pumping and man the system for twenty-four (24) hours per day.

D. Contractor shall ensure that no damage will be caused to private property as a result of temporary by-pass pumping operations. Ramps, steel plates, or other methods shall be employed by the Contractor to facilitate traffic over surface piping and hose.

E. Contractor shall complete the Work as quickly as possible and satisfactorily pass all tests, inspections, and repair all deficiencies prior to discontinuing by-pass pumping operations and returning flow to the channel.

F. During temporary by-pass pumping, do not allow water to be leaked, dumped, or spilled in or onto any area outside of the existing channel system.

G. In the event of accidental spill or overflow, the Contractor is responsible for any damages that may have occurred to public or private property including cleaning, disinfection, and other corrections to the satisfaction of the E/A at no cost to the Owner.

H. Contractor shall not intentionally damage, alter, or remove portions of the existing Inlet Facility structures for the purpose of installing a temporary by-pass pumping system without specific approval from the E/A or Inspector. If a structure is damaged, it shall be reconstructed or replaced to the satisfaction of the E/A at no additional cost to the Owner.

I. The Contractor shall be responsible for any and all damage that results directly or indirectly from the interference of storm water runoff to temporary by-passing equipment, piping, and/or appurtenances.

J. When temporary by-pass pumping operations are complete, piping shall be drained into the channel prior to disassembly, and all pumps and lines shall be flushed with clean water until all discharge is clear.

K. Temporary bypass pumping system shall be hydrostatically tested using clean water prior to use.

1. Contractor shall be responsible for furnishing testing water, and shall obtain all required permits and make provisions for conveying testing water to point of use.

2. Temporary bypass system shall be equipped with air release valves and shall be filled at a rate allowing air to release through the valves. Differential pressure across the air release valve orifices shall not exceed 5 psi during filling of the pipe. Once the system has been filled and all air purged, the installed piping system exclusive of the pumps shall be pressurized to 150% of the calculated working pressure or 40 psi, whichever is greater, measured at the lowest point along the alignment. The hydrostatic test pressure shall be maintained for a minimum of 30 minutes.

3. During the test, the piping system shall be visually observed for leakage and monitored for pressure drop. Any leaks shall be repaired at the Contractor's expense, and the piping system shall be re-tested until successfully passing the 30-minute test period without leakage or pressure drop. Testing water shall be discharged to the channel at a controlled rate to prevent surcharging.

4. Following successful completion of hydrostatic test, Contractor shall demonstrate that the installed pumping system is in good condition and ready for operation by performing a test run, successfully bypassing all water flow, for 24 hours before starting the work. Contractor shall be required to have all materials, equipment, and labor necessary to complete the work on site before isolating the channel and beginning temporary bypass pumping operations.

L. Contractor shall have adequate standby equipment available for immediate use in the event of emergency or breakdown. One (1) standby pump shall be provided for each pump utilized, to provide 100% redundancy.

3.04 – 3.09 NOT USED

3.10 SCHEDULES

A. The Contractor shall report any temporary by-pass pumping activities not included in the submitted plan to the Engineer prior to proceeding with these activities.

B. The Contractor shall cease temporary by-pass pumping operations when directed by the Engineer.

C. The Contractor shall perform leakage and pressure tests of the temporary bypass pumping discharge piping using clean water prior to actual operation. The Engineer will be given a 24 hour notice prior to testing.

3.11 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END SECTION

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PART 1 - GENERAL

1.1 Related Documents:

Drawings and general provisions of Contract, including General Conditions, Section 00700, and Supplemental General Conditions, Section 00810, and Division 1 requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 General

CONTRACTOR shall maintain reasonable local vehicular and pedestrian dust free traffic, including use of driveways, to proceed safely with minimum inconvenience, except during actual construction operations. CONTRACTOR provided flaggers shall assist traffic when a street is operating under a single lane. Two-way traffic shall be maintained at all other times unless otherwise authorized by Owner.

CONTRACTOR shall provide, at the work zone location during temporary traffic control installation, a designated Competent Traffic Control Person to ensure compliance with the traffic control plans and the provisions of the Contract. Training Certificates for the designated Competent Person shall be provided with submittals at the Precon. Training certificates for competent persons shall be good for four (4) years from the date of training. After such time the competent person must show that additional training or re-certification has been completed to maintain competent person status.

CONTRACTOR shall maintain a smooth and safe ride for traffic by placing steel plates with Asphaltic concrete berms, temporary fill or bridging and temporary surfacing with cold or hot-mix Asphaltic concrete paving in accordance with applicable City Standards.

Sidewalks shall not be obstructed, except by special permission of Owner or E/A. Access to private dwelling and to commercial establishments shall be provided at all times.

CONTRACTOR shall plan and execute his operations in a manner that will cause a minimum interference with traffic. The CONTRACTOR shall place and maintain in good condition, standard barricades at each end of the Project and at other locations where traffic is rerouted or blocked from using regular traffic lanes. Barricades and warning signs shall be in accordance with Texas Manual on Uniform Traffic Control Devices (MUTCD) and the City of Austin Transportation Criteria Manual.

Signs, barricades and warning devices informing public of construction features shall be placed and maintained by the CONTRACTOR who shall be solely responsible for their maintenance.

Unless otherwise specified elsewhere in Division 1, neither explosives nor blasting shall be permitted on this Project.

3.2 Traffic Control

3.2.1 It shall be the sole responsibility of the CONTRACTOR to furnish, install, maintain and remove barricades, detour signs, warning signs, lights and all regulatory traffic control devices of the size and type specified, at locations indicated, or as directed or approved by the OWNER in accordance with the Texas Manual on Uniform Traffic Control Devices, (MUTCD), Part VI, Traffic Control for Street and Highway Construction and Maintenance Operations and the City of Austin Transportation

Criteria Manual. Upon phase completion, the Contractor shall immediately revise the temporary traffic devices to reflect the next phase or if the project is complete remove them from the public right of way.

3.2.2 Throughout the life of the Contract, all existing roads and Traffic Control devices included in the Work shall be maintained by the CONTRACTOR to a condition, in the opinion of the OWNER, which is equal to or better than that which existed when Work commenced. Maintenance of existing roads and devices shall take priority over all other Work items and shall be subject to a seven-day-a-week, 24-hours-per-day time frame. The CONTRACTOR shall provide a smooth and safe riding surface for all vehicles along the route of this Project. This could include, but not be limited to, small cars, motorcycles, mopeds and bicycles. If the condition of the street surface deteriorates, for any reason, CONTRACTOR shall take necessary steps to insure immediate restoration.

3.2.3 During construction of streets, drainage, and utility projects, if conditions of existing street surface require maintenance to upgrade from their state when the Work began, a separate pay item may be included in Bid. Otherwise, maintenance work will not be paid for directly but will be considered subsidiary to various Bid items of this Contract.

3.2.4 In the event that CONTRACTOR fails, in opinion of OWNER, to maintain a smooth surface for public comfort, fails to provide ingress and egress to private property, and/or does not provide and maintain proper traffic control devices, OWNER may provide these services and deduct any cost thereof, including overtime and administrative expenses, from all estimates thereafter due the CONTRACTOR. Such action by the OWNER shall not relieve the CONTRACTOR of his liability to protect the public at construction site. Owner may also assess an investigation fee, as established by separate Fee Ordinance, for violations resulting in more than one deficiency report issued to Contractor.

3.2.5 A permit must be obtained from Texas Department of Transportation (TxDOT), prior to Work being performed on state highway routes passing through the City.

3.2.6 CONTRACTOR shall notify the Owner's Representative, Police Department, Fire Department, EMS, and Right of Way Management Division at least seven Calendar Days in advance of beginning proposed Work, with intention to close or partially block any street or any part thereof, or of any construction affecting free flow of traffic. The CONTRACTOR shall plan and adequately provide barricades and warning devices. The same parties shall be notified when normal traffic flow is restored.

3.2.7 Should the CONTRACTOR, in his operations, reduce an existing two-way roadway to less than 20 feet in width, CONTRACTOR shall provide a route through or around the narrowed area as approved by Owner or E/A.

3.2.8 The CONTRACTOR's Flaggers shall be required any time it is necessary for the CONTRACTOR's equipment to move into or across an open traffic lane, or at other such times as directed by the Owner's Representative. A flagger shall be utilized to aid exit of hauling equipment from open traffic lanes to the Work area, and entry of hauling equipment from Work area to open traffic lanes. Flaggers shall be dressed and conduct operations in accordance with Texas Manual on Uniform Traffic Control Devices and the Transportation Criteria Manual. Flagging operations shall be the sole responsibility of the CONTRACTOR.

3.2.9 The CONTRACTOR and Subcontractors shall confine their activities to the immediate area of the construction site and provide the following:

a. Appropriate temporary fences, barricades, and/or Metal Beam Guard Fence if required, for site work involving excavation, utility extensions, remote

construction work or other circumstances involving safety of public or protection of the work in progress.

b. Warning lights at open trenches, excavations, etc., during hours from dusk to dawn each day. Protection of structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damages caused by settlement, lateral movement, undermining, washout and other hazards.

3.3 Spoil Disposal

CONTRACTOR may make other arrangements for spoil disposal subject to E/A evaluation of the CONTRACTOR-supplied proof that the Owner(s) of the proposed site(s) has a valid fill permit issued by the appropriate governmental agency. Finally, the CONTRACTOR shall submit a haul route plan including a map of the proposed route(s) for the E/A and Owner's approval.

3.4 Restoration

WATER AND WASTEWATER CONSTRUCTION REQUIREMENTS

3.4.1 In order to minimize environmental and potential flood impacts, the sum of the amount of trench opened in advance of the completed line and the amount of trench left unfilled at any time shall be restricted to one (1) full block or 300 linear feet, whichever is less.

3.4.2 Restoration shall be an on-going process during construction operations and shall immediately precede completion of construction of each successive section of the line, which shall not exceed 1,200 linear feet without approval of the E/A.

3.5 Street Markers and Traffic Control Signs

It shall be responsibility of the CONTRACTOR to remove, preserve and reset, as required, Street Marker and Traffic Control Signs that are within construction limits to the line and heights as described in Texas Manual on Uniform Traffic Control Devices before any sidewalks or street excavation is begun. Signs shall not be laid on the ground. No payment will be made for this work but shall be considered subsidiary to the various Bid items. Traffic Sign Activity Section of the Transportation Department (457-4850) shall be notified a minimum of five Working Days prior to completion of the Project so that signs may be checked for damage. Any damage to signs or posts shall be paid for by the CONTRACTOR.

3.6 Burning Permit

Open burning within City limits will not be allowed. Trench burning shall require a permit from the Fire Marshal. Burning permits outside City limits shall be obtained from the appropriate authority.

The CONTRACTOR shall secure and pay for all burning permits.

3.7 Driveways

Unless otherwise indicated, the approach grade of existing driveways shall be modified as indicated and as directed by the Owner's Representative. The OWNER will contact property owners whose driveways require grade modification beyond street right-of-way and the OWNER will obtain their concurrence for approach grade modification. Within the right-of-way, all driveways shall be replaced with concrete driveways. Outside the right-of-way, when approach grade modifications are required, flexible base shall be placed by the CONTRACTOR to resurface existing dirt or gravel driveways; asphalt and concrete drives shall be replaced in kind by the CONTRACTOR. Excavation, Flexible Base, Portland Cement Concrete and Asphaltic Concrete, used for driveways as prescribed above shall not be measured for payment but shall be considered subsidiary to various Bid items in the Contract unless payment is included as a separate Contract pay item.

3.8 Removal or Relocation of Fences and Sprinkler Systems

Removal or relocation of privately owned fences and sprinkler systems not specified in Bid, and within public right-of-way is the primary responsibility of the property owner. OWNER will cause property owners to be aware of any known conflicts and encourage them to make desired adjustments in advance of construction. In the event the property owner does not, or will not, make adjustments necessary for construction of improvements to be made under this Contract, CONTRACTOR, after receiving written approval from the OWNER, shall remove those portions that interfere with the Work, as follows:

3.8.1 Fences shall be disassembled, by hand, into hand manageable sizes and placed on the private property.

3.8.2 For sprinkler systems, the CONTRACTOR, after assuring that electrical and/or mechanical controls are disconnected, shall remove sprinkler heads, valves, controls, and any other miscellaneous items, including distribution pipe, or wire, saw cut from the system. The CONTRACTOR shall present these materials to the property owner. Where piping is cut, the pipe shall be permanently capped or plugged, unless otherwise directed by the OWNER.

Work for removal or relocation of fences and sprinkler systems shall not be paid for directly but shall be subsidiary to the various Bid items.

End

PART 1 GENERAL

1.01 SUMMARY

A. General requirements for delivery, storage, handling, and installation of products. All equipment furnished and installed under this contract to conform to the general stipulations set forth in this Section except as otherwise specified in other Sections of the Specifications.

1.02 RELATED REQUIREMENTS

A. Painting and Protective Coatings per Section 09902, “Painting and Protective Coatings”.

B. Other related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATION Sections.

1.03 SUBMITTALS

A. Submit in compliance with Specification Section 01300, “Submittals”.
   1. Furnish a complete list of lubricants tabulated by equipment items.

1.04 QUALITY ASSURANCE

A. Manufacturer’s Experience: No equipment to be supplied from any manufacturer not regularly engaged in the production of equipment of the size and character herein specified. Generally, vendor must have installed and had in satisfactory operation inside the continental United States, for a period of not less than three years, at least one unit of the size and design comparable to the units specified. Particular equipment may require more manufacturing experience. When so, the experience requirement is specified with the equipment.

B. Coordination: Coordinate all details of the equipment with other related parts of the Work, including verification that all structures, piping, wiring, and equipment components are compatible. Perform all structural and other alterations in the Work required to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Contract Drawings or Specifications. No extra compensation will be allowed because of differences between actual dimensions and measurements indicated on the working drawings.

C. Provide the services of a technical representative for furnished equipment, for a sufficient period to assist in start-up and initial adjustment of all equipment, and to train, advise and consult with OWNER’s operating personnel.

D. All items of equipment required under this Contract to include literature explaining “Operation and Maintenance” of that item of equipment. If a manufacturer does not print such a standard O&M manual, CONTRACTOR to provide OWNER with a manual, approved in writing by the manufacturer.

E. Workmanship and Materials: Guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage or other failure. Materials to be suitable for service conditions.

F. All equipment to be designed, fabricated, and assembled in accordance with the best modern engineering and shop practice. Individual parts to be manufactured to standard sizes and gages so that repair parts, furnished at any time, can be installed in the field.

Like parts of duplicate units to be interchangeable. Equipment is not to have been in service at any time prior to delivery, except as required by tests.

G. Except where otherwise specified, structural and miscellaneous fabricated steel used in equipment to conform to AISC standards. All structural members to be designed for shock or vibratory loads. Unless otherwise specified, all steel which will be submerged, all or in part, during normal operation of the equipment to be at least 1/4-inch thick.

H. Maintenance and Repair Facility: Equipment manufacturers to have maintenance and repair facilities established and in operation in the continental United States for a period of not less than three years. Such facilities to be fully equipped and staffed with qualified personnel for making repairs to equipment provided under this contract. The facilities to carry a full line of normal maintenance spare parts.

1.05 PREPARATION FOR SHIPMENT

A. When practical, factory assemble products. Matchmark or tag separate parts and assemblies to facilitate field assembly. Cover machined and unpainted parts that may be damaged by the elements with a strippable protective coating.

B. Equipment to be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. Mark or tag outside of each package or crate to indicate its purchase order number, bill of lading number, contents by name, name of Project and CONTRACTOR, equipment number, and approximate weight. Include complete packing lists and bills of materials with each shipment.

C. Protect from exposure to the elements and keep thoroughly dry and dustfree at all times. Painted surfaces to be protected against impact, abrasion, discoloration, and other damage. Apply grease and lubricating oil to all bearings and similar items.

D. Tag or mark each item of equipment as identified in the delivery schedule or on the Shop Drawings.

E. Spare Parts, Special Tools, Test Equipment, Expendables, and Maintenance Materials:
   1. Furnish as required by the Specifications prior to:
      a. Starting functional testing; or
      b. Operation of the equipment by the OWNER; or
      c. At 75 percent of Project completion, whichever occurs first.
   2. Properly packaged to avoid damage, in original cartons insofar as possible. Replace parts damaged or otherwise inoperable.
   3. Firmly affix to, and prominently display on, each package.
      a. Minimum 3-inch by 6-inch manila shipping tag with the following information printed clearly:
         1) Manufacturer’s part description and number.
         2) Applicable equipment description.
         3) Quantity of parts in package.
         4) Equipment manufacturer.
         5) Applicable Specification Section.
         6) Name of CONTRACTOR.
         7) Project name.
   4. Deliver materials to site.
   5. Notify ENGINEER/OWNER upon arrival.

F. Bare Steel: Where steel components of equipment are specified to be shipped bare for field painting, such exposed steel to be sandblasted and primed, in accordance with Section 09902, “Painting and Protective Coatings”.

1.06 DELIVERY AND INSPECTION

A. Deliver products in accordance with the accepted current progress schedule and coordinate to avoid conflict with Work and conditions at the site. Deliver anchor bolts and templates sufficiently early to permit setting prior to placement of structural concrete.

B. Deliver products in undamaged condition, in manufacturer's original container or packaging, with identifying labels intact and legible. Include on label date or manufacture and shelf life, where applicable. Include UL labels on products so specified.

C. Coordinate with the OWNER the delivery of material at the site for storage. CONTRACTOR is responsible for acceptance of delivery of materials and supplies by his own personnel. OWNER will not accept delivery of materials for the CONTRACTOR. Make arrangements with suppliers and shipping agencies for delivery to the proper locations.

D. Unload products in accordance with manufacturer's instructions for unloading, or as specified. Record the receipt of products at the site. Inspect for completeness and evidence of damage during shipment.

E. Examine all materials furnished at the time and place of delivery and reject all noncompliant (with specifications), and/or defective or damaged material.

F. Remove noncompliant and/or damaged products from the site and expedite delivery of identical new undamaged products and remedy incomplete or lost products to provide that specified, so as not to delay the progress of the Work.

1.07 HANDLING, STORAGE AND PROTECTION

A. Handle products in accordance with the manufacturer's written instructions, and in a manner to prevent damage. Store products, upon delivery, in accordance with manufacturer's instructions, with labels intact and legible, in approved storage yards or sheds. Provide manufacturer's recommended maintenance during storage, installation, and until products are accepted for use by OWNER.

B. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration. Keep running account of products in storage to facilitate inspection and to estimate progress payments for products delivered but not installed in the Work.

C. Store electrical, instrumentation, and control products, and equipment with bearings, in weather-tight structures maintained above 60°F. Protect electrical, instrumentation, and control products, and insulation against moisture, water, and dust damage. Connect and operate continuously all space heaters furnished in electrical equipment.

D. Store fabricated products aboveground, on blocking or skids, and prevent soiling or staining. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter. Cover products that are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.

E. Store finished products that are ready for installation in dry and well ventilated areas. Do not subject to extreme changes in temperature or humidity. Protect shafts and couplings of motors with rust-preventive compound and store under cover.

F. Hazardous Materials: Prevent contamination of personnel, the storage building, and the site. Meet the requirements of the product specifications, codes, and manufacturer's instructions.

G. Care in Handling: Handle all equipment with care at all times to prevent damage. Use proper hoisting equipment, slings, and temporary supports.

1.08 - 1.11 (NOT USED)

PART 2 PRODUCTS

2.01 MANUFACTURER(S) (NOT USED)

2.02 MATERIALS AND/OR EQUIPMENT

A. General

1. Materials and equipment as specified under separate Sections of the TECHNICAL SPECIFICATIONS or as shown on PLANS.
2. Furnish new and unused materials and equipment. Like items of products furnished and installed in the Work to be end products of one manufacturer and of the same series or family of models to achieve standardization for appearance, operation and maintenance, spare parts and replacement, and manufacturer's services.
3. All materials of construction to be as regularly furnished by the equipment manufacturer for the subject item, unless otherwise specified in the individual Specification Sections.
4. Where product specifications include a named manufacturer, with or without model number, and also include performance requirements, named manufacturer's products must meet the performance specifications.
5. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
6. Provide interchangeable components of the same manufacturer, for similar components, unless otherwise specified.
7. Equipment, Components, Systems, Subsystems: Design and manufacture with due regard for health and safety of operation, maintenance, and accessibility, durability of parts, and comply with applicable OSHA, state, and local health and safety regulations.
8. Provide materials and equipment listed by UL wherever standards have been established by that agency.
9. Lubricant: Furnish three months' supply of lubricants in 5-gallon, or smaller, containers. Lubricant to be "name" brand available from local sources, and subject to approval of OWNER.

B. Drive Units: The nominal input horsepower rating of each gear or speed reducer to be at least equal to the nameplate horsepower of the drive motor. Drive units to be designed for 24-hour continuous service.

1. Gearmotors: Gearmotors to be rated AGMA Class II and to bear an AGMA nameplate.
2. Gear Reducers: Each gear reducer to be totally enclosed, oil lubricated, with antifriction bearings throughout. Worm gear reducers to have a service factor of at least 1.20. Shaft mounted gear reducers to be rated AGMA Class II. Other helical, spiral bevel and combination bevel-helical gear reducers to have a service factor of at least 1.50. Each gear reducer to bear an AGMA nameplate.
3. Variable Speed Drives: Each variable speed drive to have a service factor of at least 1.75 at maximum speed. Provide a spare belt with each variable speed drive unit employing a belt for speed change. Unless specifically permitted by the detailed equipment specifications, bracket type mounting is not acceptable for variable speed drives.
4. V-Belt Drives: Each V-belt drive to include a sliding base or other suitable tension adjustment. V-belt drives to have a service factor of at least 1.6 at maximum speed.

C. Safety Guards: All belt or chain drives, fan blades, couplings, and other moving or rotating parts to be covered on all sides by a safety guard. Unless otherwise noted in individual Specification Sections, safety guards to be fabricated from 16 USS gage or heavier galvanized or aluminum-clad sheet steel or galvanized expanded metal. Design guards for easy installation and removal. All necessary supports and accessories to be provided for each guard. Supports and accessories, including bolts, to be galvanized. Safety guards in outdoor locations to be designed to prevent the entrance of rain and dripping water.

D. Anchor Bolts
1. Equipment suppliers to furnish suitable anchor bolts for each item of equipment. Anchor bolts, together with templates or setting drawings, to be delivered sufficiently early to permit setting the anchor bolts when the structural concrete is placed. Unless otherwise specified, anchor bolts to have a minimum diameter of ¾-inch.
2. Unless otherwise indicated or specified, anchor bolts for items of equipment mounted on baseplates to be long enough to permit 1½ inches of grout beneath the baseplate and to provide adequate anchorage into structural concrete.

E. Equipment Bases: Unless otherwise indicated or specified, all equipment to be installed on concrete bases at least 6 inches high. Cast iron or welded steel baseplates to be provided for pumps, compressors, and other equipment. Each unit and its drive assembly to be supported on a single baseplate of neat design. Baseplates to have pads for anchoring all components and adequate grout holes. Baseplates for pumps to have a means for collecting leakage and a threaded drain connection. Baseplates to be anchored to the concrete base with suitable anchor bolts and the space beneath filled with grout.

F. Special Tools and Accessories: Equipment requiring periodic repair and adjustment to be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling to be furnished complete with those devices.

G. Shop Painting
1. General: All steel and iron surfaces to be protected by suitable paint or coatings applied in the shop. Surfaces, which will be inaccessible after assembly to be protected for the life of the equipment. Exposed surfaces to be finished smooth, thoroughly cleaned, and filled as necessary to provide a smooth uniform base for painting. Electric motors, speed reducers, and other self-contained or enclosed components to be shop primed or finished with a high-grade oil-resistant enamel suitable for coating in the field with an alkyd enamel. Coatings to be suitable for the environment where the equipment is installed.
2. Equipment Finish:
   a. Provide manufacturer's standard finish and color, except where specific finish or color is indicated.
   b. If manufacturer has no standard color, provide equipment with ANSI No. 61, light gray color.

H. Pressure Gauges
1. General: Furnish and install pressure gauges on the suction and discharge of all pumps, on each side of pressure reducing valves, and where shown on PLANS. Provide vacuum gauges on vacuum lines where shown. Exceptions:
   a. None.
2. Type: General service industrial grade pressure gauge for measuring process operating conditions for all services except chlorine.
3. Construction:
   a. Size: 2 ½" nominal dial size;
   b. Movement: Bourdon tube, 316 S.S., with overload and underload stops;
   c. Case & Ring: Polished stainless steel;

d. Window: Glass;
e. Connection: ¼" NPT, S.S.;
f. Pointer: Black, adjustable needle;
g. Filling: Liquid filled.

4. Accuracy: ASME grade 1A (1% of full scale)
5. Scale Range:
   a. General: As noted on PLANS or such that normal operating pressure lies between 50 and 80 percent of scale range.
   b. Vacuum Service: 0 – 30" Hg.
   c. Pump Suction Service: Compound, 0 – 30" Hg/0 – 15 psi.
6. Manufacturer: Dresser-Ashcroft Type 1009, or equal.
7. Accessories: Unless otherwise shown on PLANS, furnish, each pressure gauge with a diaphragm seal and isolation valve.
   a. Diaphragm Seal: Silicone oil filled, 316L S.S. mini diaphragm seal, direct connected to gauge. Dresser/Ashcroft Model 25-310SSL-02T-CG or equal.
   b. Isolation Valve: ¼ turn, solid body, 316 S.S. ball valve, Apollo Valve or equal.
   c. Isolation valve to be connected to parent pipe at 1" threaded tap and reducing bushing.

2.03 FABRICATION

A. General
1. Manufacture parts to U.S.A. standard sizes and gauges.
2. Two or more items of the same type to be identical, by the same manufacturer, and interchangeable.
3 Design structural members for anticipated shock and vibratory loads.
4. Modify standard products as necessary to meet performance Specifications.

B. Lubrication System
1. Require no more than weekly attention during continuous operation.
2. Convenient and accessible. Oil drains with bronze or stainless steel valves and fill plugs easily accessible from the normal operating area or platform. Locate drains to allow convenient collection of oil during oil changes without removing equipment from its installed position.
3. Provide constant-level oilers or oil level indicators for oil lubrication systems.
4. For grease type bearings, which are not easily accessible, provide and install stainless steel tubing; protect and extend tubing to convenient location. Provide "Alemite" grease fittings. Provide one grease line per fitting. One line for multiple fittings is not acceptable.
5. Install oil fill tubes and drain plugs where such are not provided on equipment.

2.04 SOURCE QUALITY CONTROL

A. Where Specifications call for factory testing to be witnessed by ENGINEER, notify ENGINEER not less than 14 days prior to scheduled test date unless otherwise specified.

B. Calibration Instruments: Bear the seal of a reputable laboratory certifying that instrument has been calibrated within the previous 12 months to a standard endorsed by the National Institute of Standards and Technology (NIST).

C. Factory Tests: Perform in accordance with accepted test procedures and document successful completion.

PART 3 EXECUTION

3.01 GENERAL (NOT USED)

3.02 PREPARATION

A. Preparation of Concrete for Equipment: Set anchor bolts to certified and approved shop drawings only, unless otherwise directed. Where necessary, provide wood or steel templates. Survey all concrete layouts before pouring and make certain that all required or necessary sleeves, inserts, and conduit are in place and secured.

B. Lubrication: Completely lubricate all equipment prior to operation. Use only manufacturer's recommended lubricant for each application. Fill lubricant reservoirs and replace consumption during testing, startup, and operation prior to acceptance of equipment by OWNER.

3.03 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

A. Equipment Drawings show general locations of equipment, devices, and raceway, unless specifically dimensioned.

B. Equipment is not to be installed or operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary for proper installation and/or operation. When employees of CONTRACTOR or his Subcontractors are not qualified, such personnel to be field representatives of the manufacturer of the equipment or materials being installed.

C. Installation: Install each type of equipment in strict accordance with good practice and in compliance with approved printed instructions of manufacturer. CONTRACTOR to provide, and have available at all times, copies of such printed instructions.

D. Grouting Equipment: Materials and general procedures for grouting equipment are found in applicable concrete sections. Follow approved manufacturer's recommendations for equipment requiring special procedure.

E. Repaint painted surfaces that are damaged prior to equipment acceptance.

F. Handle, install, connect, clean, condition, and adjust products in accordance with manufacturer's instructions and as may be specified. Retain a copy of manufacturers' instruction at site, available for review at all times.

G. For material and equipment specifically indicated or specified to be reused in the Work:
   1. Use special care in removal, handling, storage, and reinstallation to assure proper function in the completed Work.
   2. Arrange for transportation, storage, and handling of products that require offsite storage, restoration, or renovation. Include costs for such Work In the Contract Price.

3.04 EQUIPMENT CHECK-OUT

As soon as equipment is erected and lubricated, perform initial check-out and adjustments to ensure that everything is in working order. Protect all parts as necessary to prevent corrosion or deterioration until final painting.

3.05 FIELD QUALITY CONTROL

A. Qualified manufacturers' field representatives to be provided by the equipment manufacturers to perform all manufacturers' field services called for in the Specifications. At a minimum, manufacturers' field representatives to perform the following:
   1. Observe the installation;
   2. Instruct, guide, and direct CONTRACTOR's erection or installation procedures;
   3. Perform an installation check and prepare "Equipment Installation Report"; and
   4. Instruct the OWNER's personnel in the proper operation and maintenance procedures for the equipment.

   Field representative to revisit the site as often as necessary to complete installation and services satisfactory to OWNER/ENGINEER.

B. Each manufacturer's representative to furnish written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

C. Performance Testing: When the Specifications require the presence of ENGINEER, initial tests to be observed or witnessed by ENGINEER. OWNER to be reimbursed by CONTRACTOR for all costs of subsequent visits by ENGINEER to witness or observe incomplete tests, retesting, or subsequent tests.

3.06 ADJUSTMENT AND CLEANING

Perform required adjustments, tests, operation checks, and other startup activities.

3.07 FIELD FINISHING

In accordance with individual Specification Sections.

3.08 TESTING AND PLACING IN SERVICE

A. All equipment installed under this Contract to be placed into successful operation according to the written instructions of the manufacturer or the instructions of the manufacturer's field representative. All required adjustments, tests, operation checks, and other startup activity to be provided.

B. Testing and Adjustments: Complete all preliminary check-out and testing operations. Make necessary adjustments.

C. Initial Operation: Perform initial operation of process equipment with water. Make final adjustments.

3.09 - 3.10 (NOT USED)

3.11 MEASUREMENT AND PAYMENT

No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

A. General

1. When required by individual Specification Sections, submit Operation and Maintenance (O&M) data, which is specifically applicable to the scope of work and is a complete and concise depiction of the provided equipment or product. Data containing extraneous information that has to be sorted through to find applicable instructions will not be accepted. Present information in sufficient detail to clearly explain user O&M requirements at the system, equipment, and component level. Include an index preceding each submittal.
2. Package Content: For each product, system, or piece of equipment requiring submission of O&M data, submit the package required in the individual Specification Section. Package content to be as required in Paragraph 1.03, "Schedule of Operations and Maintenance Data Packages" of this Section.
3. Furnish four (4) draft Operations and Maintenance Manuals explaining the proper installation, operation, and maintenance for each piece of equipment supplied. Draft O&M Manuals will be reviewed by the ENGINEER for compliance with this Section. One (1) draft O&M Manual will be returned to CONTRACTOR noted as either "Revise & Resubmit" or "No Exception Taken".
4. CONTRACTOR to check and approve O&M Manuals for compliance with requirements of Contract and will so certify by placing CONTRACTOR stamp of approval on each manual prior to submitting to ENGINEER. Any manual submitted without CONTRACTOR's stamp will not be reviewed and will be promptly returned for proper submission. OWNER may assess CONTRACTOR a charge for reviews of same items in excess of three (3) times.
5. After all O&M Manuals are in acceptable form, CONTRACTOR to furnish to the ENGINEER four (4) bound, complete sets of Operation and Maintenance Manuals consisting of printed material previously accepted by the ENGINEER for this purpose. Manuals are to be bound in a heavy duty, fabric reinforced fiberboard, three post, expandable binder with a maximum binding width of 5″. Three-ring vinyl reinforced binders will not be acceptable. Manual to have information listed in Paragraph 1.01 B.1 printed on the front cover as well as the binder spine. Each binder to have an index outlining all information in the set of volumes.
6. Final retainage will not be released until the Operation and Maintenance Manuals have been submitted and recommended by the ENGINEER.

B. Format

1. Provide each manual with a project name, volume number, number of volumes in the set, project number, and date.
2. Furnish each volume with a complete index for all volumes in the set. The index is to indicate the volume and section for each piece of equipment.
3. Manuals to be limited to page sizes of 8½″ × 11″ or drawings folded into such size.
4. Materials in manuals to be suitable for photographic reproduction. Where copies of identical material are included, clarity and quality of copies to be equal to the original, square to the page. Faxed copies will not be accepted.
5. Manuals to be customized to describe the equipment actually furnished. Manufacturer's pre-printed literature may be accepted provided it has been modified by underlining the specific model used.
6. Divide manuals into sections paralleling the equipment specifications.

7. The front of each section to have a cover sheet indicating the CONTRACTOR performing the installation, local suppliers name, address and phone number of each piece of equipment in the section.
8. In addition to drawings supplied in the equipment sections, provide an additional, legible copy of all vendor supplied drawings for each piece of equipment in a separate binder and include as a drawing volume in the O&M manual set.
9. Binders: All draft O&M Manuals are to be bound in a folder or 3-ring binder. Un-bound, stapled, or clipped submittals will not be accepted for review. Maximum width of any single draft equipment O&M Manual is 4-inches.

1.02 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

A. Maintenance Summary Form

1. General: All Operations and Maintenance Manuals are to include a Maintenance Summary Form in the format and style of the example form attached to this Section as Attachment A. Manuals will not be accepted for review without this form. The Maintenance Summary Form is to be a typed document prepared by the equipment manufacturer specifically for the equipment furnished. Title and subheadings are to be as shown on Attachment A – they are not to be modified. If a subheading is not applicable to the specific piece of equipment, it is to be noted by the words “Not Applicable” after the heading. Additional notes and comments may be added to the end of the form at the manufacturer’s discretion.
2. Format:
   a. Size: 8½″ × 11″ (portrait orientation only).
   b. Margins: Top - 1″, Left - 0.75″, Right - 0.75″, Bottom - 0.75″.
   c. Font:
      1) Title: Arial - 16 point - bold.
      2) Subheadings: Arial - 12 point - bold.
      3) Text: Arial - 12 point - regular.
      4) Tables: As shown in Attachment A - minimum text size Arial - 10 point - regular.
3. Specific Instructions:
   a. Equipment Item: Include generic name for equipment along with service and specification reference.
   b. Manufacturer: List manufacturer’s physical address for shipping and receiving and mailing address (if different from physical address). Include telephone number and facsimile telephone number.
   c. Equipment Identification Number(s): Provide list of equipment serial numbers cross-referenced to equipment tag numbers in tabular form. When multiple items are provided, list each item separately.
   d. Total Weight: Note the assembled weight of the equipment.
   e. Nameplate Data: Reproduce the nameplate data exactly as it appears on the equipment. For driven equipment, include the driver nameplate data.
   f. Manufacturer’s Local Representative: Provide the name, address, and phone numbers of the local representative.
   g. Maintenance Requirements:
      1) Maintenance Operation: List briefly each maintenance operation required to maintain warranty in effect and refer to specific information in manufacturer’s standard maintenance manual.
      2) List required frequency of each maintenance operation.
      3) Refer by symbol to lubricant list.
   h. Lubricant List: List each recommended lubricant by symbol, noting generic type of lubricant, and a minimum of two manufacturers. The Owner has a standing supply contract with Exxon/Mobil. The recommended lubrication products shall include a specific cross reference to an equivalent Exxon (Mobil) product.

i. Spare Parts: Include recommendations regarding what spare parts, if any, should be maintained on site for routine maintenance.

j. CONTRACTOR's Job Order: Identify CONTRACTOR's purchase order number.

k. Closest Service Technician: Identify the closest, factory trained, and authorized, service technician by name, address and telephone number. Include pager number if applicable.

l. Closest Parts and Service Center: List closest factory authorized parts and service center, the physical address for shipping and receiving and mailing address (if different from physical address). Include telephone number and facsimile telephone number.

B. Asset Management Tracking Form: CONTRACTOR shall provide a completed COA Asset Management Tracking Form. A sample Asset Management Tracking Form is included as Attachment B. CONTRACTOR shall coordinate with the OWNER and request the latest version of the form prior to completing the information. The OWNER will provide the form in an editable, electronic version for use by the CONTRACTOR. Provide data for all tagged equipment and components.

1. In addition to the information shown in Attachment B, the CONTRACTOR shall provide the installation cost and the Manufacturer's expected useful life for each line item in the Attachment.

C. Operating Instructions: Include specific instructions, procedures, and illustrations for the following phases of operation.

D. Safety Precautions: List personnel hazards and equipment or product safety precautions for all operating conditions.

E. Normal Operations: Include control diagrams with data to explain operation and control of equipment.

F. Service Requirements: Include instructions for services to be performed such as adjustments and inspection.

G. Environmental Conditions: Include a list of environmental conditions (temperature, humidity, and other relevant data) for each product or piece of equipment under which it is best suited to operate.

H. Preventative Maintenance: Preventative Maintenance Plan and Schedule to include manufacturer's schedule for routine preventative maintenance and inspections required to ensure proper and economical operation and to minimize corrective maintenance and repair. Provide manufacturer's projection of preventative maintenance man-hours on an annual basis.

I. Corrective Maintenance:

1. Troubleshooting Guides and Diagnostic Techniques: Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or requires replacement.

2. Wiring Diagrams and Control Diagrams: Wiring diagrams and control diagrams to be point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and the terminals for each type, identically to actual installation numbering. Furnish control schematics reproduced from control schematics shown on PLANS with modifications as required, but not redrawn or redesigned in another format.

3. Maintenance and Repair Procedures: Include instructions and list tools required to restore product or equipment to proper condition or operating standards.
4. Removal and Replacement Instructions: Include step-by-step procedures and list required tools and supplies for removal and replacement of components, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Instructions to include a combination of text and illustrations.
5. Spare Parts and Supply Lists: Include lists of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays.
6. Corrective Maintenance Man-Hours: Include manufacturer's projection of corrective maintenance man-hours. Corrective maintenance that requires participation of the equipment manufacturer to be identified and tabulated separately.
7. List of all protective relays, breaker types, cable and fuse sizes and settings (where applicable).
    a. Protective Relays: Provide information on the relay type used and time current curves.
    b. Breakers: Provide catalog numbers and breaker trip curves.
    c. Cables: Provide cable size, cable type and length of each cable installed.
    d. Power Fuses: Provide fuse catalogue number, rating and fuse curve.
8. Documentation of field functional tests and performance test described in the specifications. Include the test results and calibration reports of all equipment.
9. Renewal Parts Bulletin: Include parts lists pertinent to the components used in the installation.
10. Calibration data sheet including set points: Include all calibration data sheets.

J. Appendices: Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:
1. Parts Identification: Provide identification and coverage for all parts of each component and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without any further identification required. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations and separate listing to show the index, reference, or key number which will cross-reference the illustrated part to be the listed part. Parts shown in the listings to be grouped by components.
    a. Manufacturer's Standard Commercial Practice (MSCP): The parts data may cover more than one model or series of equipment, components, attachments, or accessories, such as a master parts catalog, in accordance with the manufacturer's standard commercial practice.
    b. Other than Manufacturer's Standard Commercial Practice (MSCP): Final assembly manufacturer may add a cross-reference to implement components' assemblies and parts requirements when implementation in manual form varies significantly from the style, format, and method of manufacturer's standard commercial practice. Use the format in the following example:

Final Assembly Manufacturer's Alphanumeric Sequence	Actual Manufacturer's Name and MSCP	Actual Manufacturer Part No.
100001	John Doe & Co. 00000	2000002

2. Warranty Information: List and explain the various warranties and include the servicing and technical precautions prescribed by the manufacturers or Contract Documents to keep warranties in force.
3. Testing Equipment and Special Tool Information: Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components.

1.03 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

A. Furnish the O&M data packages specified in individual technical sections. The required information for each O&M data package is as follows:
1. Maintenance Summary Form;
2. Asset Management Tracking Form;
3. Safety precautions;
4. Normal operations;
5. Environmental conditions;
6. Preventive maintenance plan and schedule;
7. Troubleshooting guides and diagnostic techniques;
8. Maintenance and repair procedures;
9. Removal and replacement instructions;
10. Wiring diagrams and control diagrams;
11. Spare parts and supply list;
12. Parts identification;
13. Warranty information;
14. Testing equipment and special tool information; and
15. Approved and corrected shop drawings showing "as-built" conditions.

1.04 SPECIAL SUBMITTAL REQUIREMENTS

A. All Operation and Maintenance Instruction Manuals, catalog sheets, product and component data sheets, and factory and on-site (field) test reports/data shall be submitted in bound hard-copies and electronic copies. Electronic copies shall be in the source software, where possible, including MS Word, Excel, Access, or AutoCad. Other documents not prepared using these software packages shall be submitted in searchable Adobe Acrobat® (*.pdf files) latest edition, and shall be submitted electronically and on a thumbdrive.

B. Binders and File Organization of the Electronic Copies: Clearly label each copy of the electronic version of the O&M Manuals. The electronic volume numbers, organization of the electronic files contained within, and labeling formats shall match and be identical to those of the hard-copies. Additionally, in each electronic volume, a navigation tool shall be installed that shall guide and navigate the user to open and/or close a desired section and/or subsection (within each volume) simply by clicking on the section/subsection name and number. Install a hard copy of the table of contents with each thumbdrive. All labels and tables of contents shall be neatly typed and labeled. Handwritten labels and/or tables of contents will not be accepted. Install a neatly typed label on each case that shall provide all the information required to be listed on the cover of the O&M Manuals by these Specifications.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 O&M DATA PACKAGES

Furnish a draft O&M data package for equipment a minimum of four (4) weeks prior to conducting operator training on the equipment. Draft O&M data packages to include, at a minimum, the information defined in Paragraphs 1.03 A.1 through 1.03 A.8.

3.02 - 3.10 (NOT USED)

3.11 MEASUREMENT AND PAYMENT

No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

ATTACHMENT A

MAINTENANCE SUMMARY FORM

1. EQUIPMENT ITEM:

2. MANUFACTURER INFORMATION:

3. EQUIPMENT IDENTIFICATION NUMBER(S):

Equipment Tag Number	***Equipment Serial Number***	***Driver Serial Number***

4. TOTAL WEIGHT:

5. NAMEPLATE DATA (HP, Voltage, Speed, etc.):

6. MANUFACTURER'S LOCAL REPRESENTATIVE:

7. MAINTENANCE REQUIREMENTS:

Maintenance Operation	***Frequency***	***Lubricant*** (if applicable)	***Comments***

8. LUBRICANT LIST:

9. SPARE PARTS:

Part Description	***Quantity***	***Part Number***

10. CONTRACTOR'S JOB ORDER:

11. CLOSEST SERVICE TECHNICIAN:

12. CLOSEST PARTS AND SERVICE CENTER:

City of Austin
Austin Water Utility
Asset Management Tracking Form

Facility	Project Number	Project ID

Equipment Position /Location Tag	Equipment Description	Manufacturer	Model	Serial Number	Asset Number Sticker	Startup Date	Warranty Expiration Date	Estimated Replacement Material Cost	Estimated Replacement Labor Cost	Expected Useful Life	Start Reading	Expiration Reading	Service Contract Available?

END OF SECTION

ARTICLE 1 - GENERAL

1.1 RELATED DOCUMENTS

The following documents are a part of this section:

All documents in Bidding Requirements, Contract Forms and Conditions of the Contract.

Other sections of Division 1 - General Requirements apply to this section.

1.2 DESCRIPTION AND INTENT OF THE WORK

No asbestos containing material (ACM) shall be brought onto the Project site, and/or incorporated into the Project construction without the written consent of the OWNER. Any asbestos containing material found at any time including after contract completion, to have been brought onto the site or incorporated into the Project construction by the CONTRACTOR, or any Subcontractors, Sub-Subcontractors or Suppliers, shall be removed and disposed of in accordance with the then current governmental regulatory standards.

All costs associated with the inspection, sampling, testing, removal and disposal of ACM as described above shall be paid by the CONTRACTOR.

1.3 DEFINITIONS

ASBESTOS: The asbestiform varieties of serpentine (chrysotile), riebeckite (crocidolite) cummingtonite-grunerite (amosite), anthophyllite, actinolite and tremolite.

ASBESTOS CONTAINING MATERIAL (ACM): Any material containing more than one percent (1%) by weight of asbestos of any type or mixture of types.

ASBESTOS CONTAINING BUILDING MATERIAL (ACBM): Any material used in the construction of, or incorporated into the construction of, any building that contains more than one percent (1%) by weight of asbestos of any type or mixture of types.

MSDS: A material safety data sheet (MSDS) is a form containing data regarding the properties of component substances that comprise a manufactured product. They are a basic hazard communication tool that gives details on chemical and physical dangers, safety procedures, and emergency responses for chemicals.

1.4 QUALITY ASSURANCE

PROHIBITION OF ASBESTOS CONTAINING MATERIALS

The E/A has been instructed to not permit any asbestos containing materials to be specified, requested or approved for use in conjunction with this Project.

The E/A has signed the following:

A. 01900A Statement of Non-Inclusion of Asbestos Containing Material (E/A, Prior to Design): stating that the Engineer/Architect shall not specify, request or approve any ACM in this Project without prior written approval of OWNER.

B. 01900B Statement of Non-Inclusion of Asbestos Containing Material (E/A, After Design): stating that the Engineer/Architect has not specified, requested or approved any ACM in this Project without the prior written approval of the OWNER, and that any ACM allowed in this Project is identified in the Statements.

These Statements are included in the Construction Documents.

ASBESTOS CONTAINING MATERIALS PROHIBITED FROM SITE

No asbestos containing materials will be permitted as part of the Project construction. The following list is intended to be used as a general guide to show which types of materials are suspected to contain asbestos:

- Cement Pipes
- Cement Wallboard
- Cement Siding
- Asphalt Floor Tile
- Vinyl Floor Tile
- Vinyl Sheet Flooring/vinyl wall coverings
- Flooring Backing
- Construction Mastics (floor tile, carpet, ceiling tile, etc.)
- Acoustical Plaster
- Decorative Plaster / stucco
- Textured Paintings/Coatings
- Ceiling Tiles and Lay-in Panels
- Spray-Applied Insulation
- Blown-in Insulation
- Fireproofing Materials
- Taping Compounds (thermal)
- Packing Materials (for wall/floor penetrations)
- High Temperature Gaskets
- Laboratory Gloves
- Fire Blankets
- Fire Curtains
- Elevator Equipment Panels
- Elevator Brake Shoes
- HVAC Duct Insulation
- Boiler Insulation
- Breeching Insulation
- Ductwork Flexible Fabric Connections
- Cooling Towers
- Pipe Insulation (corrugated air-cell, block, etc.)
- Heating and Electrical Ducts
- Electrical Panel Partitions
- Electric Cloth
- Electric Wiring Insulation
- Chalkboards
- Roofing Shingles / tiles / membranes
- Roofing Felt
- Roof Coatings
- Base Flashing
- Thermal Paper Products
- Fire Doors
- Caulking/Putties
- Adhesives / mastics
- Wallboard
- Joint Compounds
- Spackling Compounds
- Laboratory hoods/tabletops
- CMU block fill materials

If any of these suspect materials are specified for use on the Project, and if they do not have specific labelling identifying them as asbestos free, then the CONTRACTOR shall notify the OWNER immediately. Laboratory analysis of the material by an OWNER-approved laboratory shall be performed at CONTRACTOR's expense in order to warrant that the material does not contain asbestos. A copy of the package labelling or results of laboratory testing must be provided to the OWNER prior to inclusion of the specified material during construction. Contractor's construction submittals must include MSDSs for all new materials used in construction of buildings, facilties and infrastructure.

1.5 SUBMITTALS

NON-USE OF ASBESTOS AFFIDAVITS

At the time that the CONTRACTOR signs the Agreement, they shall sign a Non-Use of Asbestos Affidavit (Contractor Prior to Construction), Contract Document 00680. This Affidavit certifies that the CONTRACTOR agrees that they will not allow any asbestos containing materials to be incorporated into the construction of the Project or allow any asbestos containing building materials on the site for which the OWNER has not given prior written approval.

Prior to final payment, the CONTRACTOR will provide to the OWNER a Non-Use of Asbestos Affidavit (Contractor After Construction), Contract Document 00681. This Affidavit certifies that the CONTRACTOR did not allow asbestos containing materials to be incorporated into the construction or allowed any

asbestos containing building materials on the site for which the OWNER of the Project did not give prior written approval.

ASBESTOS CONTAINING MATERIALS: When any asbestos containing materials are used on the Project, provide the following information:

A detailed description of the material containing the asbestos.

The type and percent of asbestos contained in the material.

The quantity of the materials used, including the square footage, or in the case of pipe insulation, the size and linear footage.

A drawing showing the exact location of any asbestos containing materials.

Final payment shall be withheld until the above described Affidavits, submittals and/or information are received and approved.

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CITY OF AUSTIN

STATEMENT OF NON-INCLUSION OF ASBESTOS CONTAINING MATERIAL

STATE OF TEXAS
COUNTY OF TRAVIS

ENGINEER/ARCHITECT PRIOR TO DESIGN

"My name is Jonathan Chen, hereinafter known as Authorized Representative.

"I am over the age of 18 years and I have never been convicted of a crime. I am the Project Manager of AECOM Technical Services, Inc. hereinafter known as ENGINEER/ARCHITECT.

"I am fully competent to make this statement. I have personal knowledge of the facts set forth below and they are all true and correct.

"WHEREAS ENGINEER/ARCHITECT has been selected to provide designs, to prepare the bid and construction documents, and to assist the City of Austin, Texas, hereinafter known as OWNER, during the construction of Waller Creek Tunnel Inlet Facility Wet Well Mechanical Screening Sytsem, located at 500 East 12th Street, Austin, Texas, hereinafter known as Project, and

"WHEREAS asbestos in a dust form is a recognized health hazard, and
"WHEREAS the OWNER desires not to have any asbestos containing materials used or incorporated into the construction of the Project;
"THEREFORE the ENGINEER/ARCHITECT affirms that to the best of its knowledge and belief:

1. The ENGINEER/ARCHITECT, any person, firm or organization representing or represented by the ENGINEER/ARCHITECT, shall not knowingly specify, request, or approve for use in conjunction with the Project, any asbestos containing materials or any other materials defined as containing asbestos by any laws, rules or regulations promulgated by the United States Government, the State of Texas or any governmental organization or agency operating under the authority of either of those entities.
2. Realizing that there might be materials required in which a satisfactory non-asbestos containing material cannot be obtained, the ENGINEER/ARCHITECT will do the following before specifying any asbestos containing material:
   A. Inform the OWNER's Project Manager for this Project, in writing, of any intent to specify asbestos containing materials.
   B. Receive written approval from the City of Austin Project Manager for the specifying of any asbestos containing materials.
   C. At the completion of the design phase, and before the OWNER receives any bids for this Project, provide to the Project Manager, in writing, the proposed location of any asbestos containing materials, the type of asbestos they contain, and the percent of asbestos by types.
3. The ENGINEER/ARCHITECT states its understanding that if any asbestos containing materials not approved by the OWNER for inclusion into the Project, are determined, as a result of any inspection and sample analysis performed by an individual(s) and/or firm(s) certified and/or licensed to perform such inspection by the United States Government and/or the State of Texas, to have been knowingly specified, requested and/or approved by the ENGINEER/ARCHITECT for inclusion in the Project, the OWNER shall look to the ENGINEER/ARCHITECT for reimbursement of any and all costs incurred in the removal and/or other abatement of said asbestos containing materials.
4. ENGINEER/ARCHITECT further understands that OWNER shall also look to the ENGINEER/ARCHITECT for any and all damages to OWNER which result from the inability of the OWNER to use any portion or all of the Project due to the incorporation of asbestos containing materials that have been knowingly specified, requested and/or approved by the ENGINEER/ARCHITECT.
5. ENGINEER/ARCHITECT further understands that OWNER will pursue reimbursement of any said cost and compensation for any said damages from the ENGINEER/ARCHITECT by any and every means within OWNER's right and power.

Signature of Authorized Representative: _____

STATE OF TEXAS
COUNTY OF TRAVIS

ON February, 14th, 2023 personally appeared Jonathan Illin chen and been duly sworn by me, subscribed to the foregoing statement and has stated that the facts stated therein are true and correct.

RYAN PALENSKE
NOTARY PUBLIC · STATE OF TEXAS
ID # 13243293-7
COMM. EXP. 03-25-2024

Notary Public, State of Texas _____

Printed Name of Notary Ryan Palenske

My Commission Expires: 03/25/2024

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CITY OF AUSTIN

STATEMENT OF NON-INCLUSION OF ASBESTOS CONTAINING MATERIAL

STATE OF TEXAS
COUNTY OF TRAVIS

ENGINEER/ARCHITECT AFTER DESIGN

"My name is Jonathan Chen, hereinafter known as Authorized Representative.

"I am over the age of 18 years and I have never been convicted of a crime. I am the Project Manager of AECOM Technical Services, Inc. hereinafter known as ENGINEER/ARCHITECT.

"I am fully competent to make this statement. I have personal knowledge of the facts set forth below and they are all true and correct.

"WHEREAS ENGINEER/ARCHITECT has been selected to provide designs, to prepare the bid and construction documents, and to assist the City of Austin, Texas, hereinafter known as OWNER, during the construction of Waller Creek Tunnel Inlet Facility Wet Well Mechanical Screening System, located at 500 East 12th Street Austin, Texas, hereinafter known as Project, and

"WHEREAS asbestos in a dust form is a recognized health hazard, and
"WHEREAS the OWNER desires not to have any asbestos containing materials used or incorporated into the construction of the Project;
"THEREFORE the ENGINEER/ARCHITECT affirms that to the best of its knowledge and belief:

1. The ENGINEER/ARCHITECT, any person, firm or organization representing or represented by the ENGINEER/ARCHITECT, shall not knowingly specify, request, or approve for use in conjunction with the Project, any asbestos containing materials or any other materials defined as containing asbestos by any laws, rules or regulations promulgated by the United States Government, the State of Texas or any governmental organization or agency operating under the authority of either of those entities.
2. The only exceptions to the above statement are the following materials that are required because a satisfactory non-asbestos containing material cannot be obtained. The inclusion of these materials has been approved by the OWNER's Project Manager for this Project.

   N/A

3. The ENGINEER/ARCHITECT states its understanding that if any asbestos containing materials not approved by the OWNER for inclusion into the Project, are determined, as a result of any inspection and sample analysis performed by an individual(s) and/or firm(s) certified and/or licensed to perform such inspection by the United States Government and/or the State of Texas, to have been knowingly specified, requested and/or approved by the ENGINEER/ARCHITECT for inclusion in the Project, the OWNER shall look to the ENGINEER/ARCHITECT for reimbursement of any and all costs incurred in the removal and/or other abatement of said asbestos containing materials.
4. ENGINEER/ARCHITECT further understands that OWNER shall also look to the ENGINEER/ARCHITECT for any and all damages to OWNER which result from the inability of the OWNER to use any portion or all of the Project due to the incorporation of asbestos containing materials that have been knowingly specified, requested and/or approved by the ENGINEER/ARCHITECT.
5. ENGINEER/ARCHITECT further understands that OWNER will pursue reimbursement of any said cost and compensation for any said damages from the ENGINEER/ARCHITECT by any and every means within OWNER's right and power.

Signature of Authorized Representative: _____

STATE OF TEXAS
COUNTY OF TRAVIS

ON February, 14th, 2023 personally appeared Jonathan Illin chen and been duly sworn by me, subscribed to the foregoing statement and has stated that the facts stated therein are true and correct.

NOTARY PUBLIC STATE OF TEXAS
RYAN PALENSKE
NOTARY PUBLIC - STATE OF TEXAS
ID # 13243293-7
COMM. EXP. 03-25-2024

Notary Public, State of Texas _____

Printed Name of Notary Ryan Palenske

My Commission Expires: 03/25/2024

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Item No. 104S
Removing Portland Cement Concrete

104S.1 Description

This item shall govern the demolition, removal and satisfactory disposal of existing Portland cement concrete, as classified, at locations indicated on the Drawings or as directed by the Engineer or designated representative.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text inch-pound units are given preference followed by SI units shown within parentheses.

104S.2 Submittals

The submittal requirements of this specification item may include:

A. A permit when utility adjustments are made in the right-of-way, and

B. A plan for removal and deposition of all 'broken up' existing Portland cement (p.c.) concrete materials and debris.

104S.3 Classification

Existing Portland cement concrete, when removed under this section, will be classified as follows:

1. Concrete Curb will include curb, curb and gutter and combinations thereof,
2. Concrete Slabs will include, but not be limited to, house slabs, patio slabs, porch slabs, concrete riprap and concrete pavement,
3. Sidewalks and Driveways will include concrete sidewalks and driveways,
4. Concrete Walls will include all walls, regardless of height, and wall footings,
5. Concrete Steps will include all steps and combinations of walls and steps,
6. Abandoned Foundations will include abandoned utility foundations,
7. Miscellaneous Concrete shall include all other concrete items, which are not identified in items 1 through 6 above.

104S.4 Materials

Mortar shall conform to mortar specified in Standard Specification Item No. 403S, “Concrete for Structures”.

104S.5 Construction Methods

Prior to commencement of this work, all required erosion control and tree protection measures shall be in place. The existing utilities shall be located and protected as specified in the Standard Contract Documents, Section 00700, "General Conditions". A permit shall be required when utility adjustments are to be made in preparation for

highway construction, as specified in Section 5.2.0 of the City of Austin Utilities Criteria Manual.

The existing Portland cement concrete shall be broken up, removed in accordance with Item No. 101S, "Preparing Right of Way" and disposed of by the Contractor and deposited at a permitted disposal site.

When it is specified that only a portion of the existing Portland cement (p.c.) concrete is to be removed and that the remaining p.c. concrete will continue to serve its purpose, special care shall be exercised to avoid damage to that portion which will remain in place. Unless otherwise established by the Engineer or designated representative, existing p.c. concrete shall be cut to the neat lines, that are indicated on the Drawings, by sawing with an appropriate type circular type circular concrete saw to a minimum depth of 1/2 inch (12.5 mm). Any reinforcing steel encountered shall be cut off 1 inch (25 mm) inside of p.c. concrete sawed line. Any existing p.c. concrete, which is damaged or destroyed beyond the neat lines so established, shall be replaced at the Contractor's expense. Remaining p.c. concrete shall be mortared to protect the reinforcing steel and provide a neat clean appearance.

When reinforcement is encountered during the removal of portions of existing structures to be modified, a minimum of 1 foot (300 mm) of steel length shall be cleaned of all old p.c. concrete and left in place to tie into the new construction where applicable. All unsuitable material shall be removed and replaced with approved material. All foundations, walls or other objectionable material shall be removed to a minimum depth of 18 inches (450 mm) below all structures and 12 inches (300 mm) below areas to be vegetated.

104S.6 Measurement

When included in the contract as a separate pay item, the removal of p.c. concrete curb and p.c. concrete wall as prescribed above will be measured by the lineal foot (meter: 1 meter is equal to 3.281 feet) in its original position regardless of the dimensions or size. The removal of p.c. concrete slabs, p.c. concrete sidewalks and driveways, as prescribed above, will be measured by the square foot (square meter: 1 square meter is equal to 10.764 square feet) in original position, regardless of the thickness and existence of reinforcing steel. Portland cement concrete steps removed will be measured per lineal foot (meter: 1 meter is equal to 3.281 feet) of each individual step tread including the bottom step. The removal of p.c. concrete foundations will be measured per each individual foundation. The removal of miscellaneous concrete will be measured per lump sum.

104S.7 Payment

The work and materials presented herein will generally not be paid for directly, but shall be included in the unit price bid for the item of construction in which this item is used.

When specified in the contract bid form as a separate pay item, the item will be paid for at the contract unit bid price(s) for "Remove P.C. Concrete Curb", "Remove P.C. Concrete Slab", "Remove P.C. Concrete Sidewalks and Driveways", "Remove P.C. Concrete Walls", "Remove P.C. Concrete Steps", "Remove P.C. Concrete Foundations" and "Remove Miscellaneous P.C. Concrete". The bid prices shall include full compensation for all Work herein specified, including the disposal of all material not required in the

Work, the furnishing of all materials, equipment, tools, labor and incidentals necessary to complete the Work.

Payment will be made under one of the following:

Pay Item No.	**104S-A:**	Remove P.C. Concrete Curb	Per Lineal foot.
Pay Item No.	**104S-B:**	Remove P.C. Concrete Slab	Per Square foot.
Pay Item No.	**104S-C:**	Remove P.C. Concrete Sidewalks and Driveways	Per Square foot
Pay Item No.	**104S-D:**	Remove P.C. Concrete Wall	Per Lineal foot.
Pay Item No.	**104S-E:**	Remove P.C. Concrete Steps	Per Lineal foot.
Pay Item No.	**104S-F:**	Remove P.C. Concrete Foundations	Per Each.
Pay Item No.	**104S-G:**	Remove Miscellaneous P.C. Concrete	Per Lump Sum.

End

SPECIFIC CROSS REFERENCE MATERIALS
Specification Item 104S, "REMOVING CONCRETE"

City of Austin Standard Contract Documents

Designation	Description
00700	General Conditions

City of Austin Utilities Criteria Manual

Designation	Description
Section 5.2.0	Permit for Excavation in the Public Right-of-Way

City of Austin Standard Specifications

Designation	Description
Item No. 101S	Preparing Right of Way
Item No. 110S	Street Excavation
Item No. 111S	Excavation
Item No. 120S	Channel Excavation
Item No. 132S	Embankment
Item No. 403S	Concrete for Structures
Item No. 610S	Preservation of Trees and Other Vegetation

RELATED CROSS REFERENCE MATERIALS

City of Austin Standard Contract Documents

Designation	Description
01500	Temporary Facilities
01550	Public Safety and Convenience

The Code of the City of Austin, Code of Ordinances, Volume 1

Designation	Description
Article 14-11-181	Permit Required
Article 14-11-189	Conditions for Permit Issuance
Article 14-11-190	Excavation Sequence and Permit Term

City of Austin Standard Specifications

Designation	Description
Item No. 201S	Subgrade Preparation
Item No. 602S	Sodding for Erosion Control
Item No. 604S	Seeding for Erosion Control

Item No. 622S	Diversion Dike
Item No. 628S	Sediment Containment Dikes
Item No. 642S	Silt Fence

RELATED CROSS REFERENCE MATERIALS - Continued
Specification Item 104S, "REMOVING CONCRETE"

City of Austin Standard Details

Designation	Description
610S-1	Tree Protection Fence Locations
610S-2	Tree Protection Fence, Type B Chainlink
610S-3	Tree Protection Fence, Type B Wood
610S-4	Tree Protection Fence, Modified Type A
610S-5	Tree Protection Fence, Modified Type B
621S-1	Diversion
622S-1	Diversion Dike
624S-1	Earth Outlet Sediment Trap
625S-1	Grade Stabilization Structure
627S-1	Grass Lined Swale
627S-2	Grass Lined Swale With Stone Center
628S	Triangular Sediment Filter Dike
628S-1	Hay Bale Dike
629S-1	Brush Berm
630S-1	Interceptor Dike
631S-1	Interceptor Swale
632S-1	Storm Inlet Sediment Trap
633S-1	Landgrading
634S-1	Level Spreader
635S-1	Perimeter Dike
636S-1	Perimeter Swale
637S-1	Pipe Slope Drain (Flexible)
637S-2	Pipe Slope Drain (Flexible)
638S-1	Pipe Outlet Sediment Trap
639S-1	Rock Berm
641S-1	Stabilized Construction Entrance
642S-1	Silt Fence
643S-1	Stone Outlet Structure
644S-1	Stone Outlet Sediment Trap

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Designation	Description
Item No. 100	Preparing Right of Way
Item No. 104	Removing Concrete
Item No. 110	Excavation
Item No. 112	Subgrade Widening
Item No. 132	Embankment
Item No. 158	Specialized Excavation Work
Item No. 420	Concrete Structures

Item No. 504S
Adjusting Structures

504S.1 Description

This item shall govern the removal and replacement of surfacing, furnishing of materials, adjusting and/or repositioning existing structures, valve boxes, pull boxes, survey monument boxes and water meters in accordance with these specifications to the locations or elevations indicated on the Drawings or as directed by the Engineer or designated representative. This item shall also govern any pumping, bailing and drainage required to complete the Work and Standard Specification Item No. 509S, "Excavation Safety Systems" for trench walls when indicated on the Drawings.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text the inch-pound units are given preference followed by SI units shown within parentheses

504S.2 Submittals

The submittal requirements of this specification item include:

A. Aggregate type, gradations and physical characteristics for the Portland cement concrete mix.

B. Proposed proportioning of materials for the mortar mix.

C. Type structures and proposed adjustment technique (lowering, raising, lateral displacement).

D. Type structure, repair technique and materials to be furnished (new replacement or reuse of existing) Type of mixing plant and associated equipage including chart indicating the calibration of each cold bin

504S.3 Materials

Precast reinforced concrete rings and castings in good condition, which are removed from the structures to be adjusted, may be reused with the written approval of the Engineer or designated representative. Additional materials required shall conform to the details indicated on the Drawings.

A. Portland Cement Concrete

The Portland cement concrete shall be Class A conforming to Standard Specification Item No. 403S, "Concrete for Structures".

B. Mortar

Unless otherwise specified or approved by the Engineer or designated representative, the mortar for bedding castings shall consist of one (1) part Portland cement and three (3) parts sand, by volume based on dry materials. Sufficient water will be added to provide the desired consistency. The gradation of the fine aggregate shall meet the requirements for "Fine Aggregate" as given in Standard Specification Item No. 403S, "Concrete for Structures".

504S.4 Construction Methods

All adjustments shall be completed prior to the placement of the final surface.

Pull box and valve box components scheduled for reuse shall be carefully removed and the contact areas shall be cleaned of all mortar, concrete, grease and sealing compounds. Any items broken in the process of removal and cleaning shall be replaced in kind by the Contractor at its own expense.

If the adjustment involves slight lowering or raising a valve box or survey monument box, the outside shell of a slip or screw casing shall be excavated to its full length and adjusted to the proposed grade. Pipe castings shall be excavated to the depth required to cut from or weld a section to the casing as may be needed to adjust the ring to the proposed elevation. The ring shall be welded to the casing prior to pouring concrete around the casing.

If the adjustment involves a vertical (lowering or raising) or a horizontal reassignment of a water meter and the property owner's cut off valve, this work shall be completed in accordance with Standard Installation Details included in the City of Austin Standard Details Series (501S-1, 504S-3, 511S-13A, 511S-13B, etc.).

After the adjustments have been completed and cured, structures within the paved area shall be paved as indicated on the Drawings.

504S.5 Measurement

The work performed and materials furnished as prescribed by this item as indicated shall be measured per each.

504S.6 Payment

The work performed, materials furnished and measures as provided above, will be paid by the unit bid price per each. The price shall include full compensation for furnishing all materials, handling, placing, labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under one of the following:

Pay Item No. 504S-1WM:	Adjusting Water Meters -	Per Each
Pay Item No. 504S-1RM:	Repositioning & Adjusting Water Meters -	Per Each
Pay Item No. 504S-3G:	Adjusting Gas Valve Boxes to Grade -	Per Each
Pay Item No. 504S-3S:	Adjusting Survey Monument Boxes to Grade -	Per Each
Pay Item No. 504S-3W:	Adjusting Water Valve Boxes to Grade -	Per Each
Pay Item No. 504S-4PB:	Adjusting Pull Boxes to Grade -	Per Each

End

SPECIFIC CROSS REFERENCE MATERIALS
Specification 504S, “Adjusting Structures”

City of Austin Standard Specifications

Designation	Description
Item No. 403S	Concrete for Structures
Item No. 509S	Excavation Safety Systems

City of Austin Standard Details

Designation	Description
No. 501S-1	Encasement Detail W/ Casing Spacers
No. 504S-3	Gas Valve Casing Adjustment
No. 511S-13A	Water Valve Box Adjustment to Grade w/ Full Depth Concrete
No. 511S-13B	Water Valve Box Adjustment to Grade w/ Concrete and HMAC

RELATED CROSS REFERENCE MATERIALS
Specification 504S, “Adjusting Structures”

City of Austin Standard Specifications

Designation	Description
Item No. 501S	Jacking or Boring
Item No. 503S	Frames, Grates, Rings and Covers
Item No. 505S	Concrete Encasement and Encasement Pipe
Item No. 507S	Bulkheads
Item No. 508S	Miscellaneous Structures and Appurtenances
Item No. 511S	Water Valves

City of Austin Standard Details

Designation	Description
No. 1100S-1	Casting Adjustment
No. 725S-1	Monument, Type A Survey Identification Marker
No. 725S-2	Monument, Type B Survey Identification Marker
No. 725S-3	Monument, Type C Survey Identification Marker
No. 725S-7	Survey Identification Marker Non-Traffic Construction Detail
No. 725S-10	Survey Identification Marker Roadway Construction Detail
No. 725S-11	Adjustable Valve Box For Survey Monument

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Designation	Description
Item No.421	Portland Cement Concrete

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ITEM NO. 510 PIPE 11-07-22

510.1 Description

This item governs the furnishing and installing all pipe and/or materials for constructing pipe mains, sewers, laterals, stubs, inlet leads, service connections, culverts, temporary service lines and temporary diversion lines, including all applicable Work such as excavating, bedding, jointing, backfilling materials, tests, concrete trench cap, concrete cap and encasement, etc., prescribed under this item in accordance with the provisions of the Edwards Aquifer Protection Ordinance, when applicable, and City of Austin (COA) Utility Criteria Manual, Section 5, "Working in Public Rights-of-Way." The pipe shall be of the sizes, types, class and dimensions indicated or as designated by the Engineer/Architect (E/A) and shall include all joints or connections to new or existing mains, pipes, sewers, manholes, inlets, structures, etc., as may be required to complete the Work in accordance with specifications and published standard practices of the trade associations for the material specified and to the lines and grades indicated. This item shall include any pumping, bailing, and drainage when indicated or applicable. Unless otherwise provided, this item shall consist of the removal and disposition of trees, stumps and other obstructions, old structures or portions thereof such as house foundations, old sewers, masonry or concrete walls, the plugging of the ends of abandoned piped utilities cut and left in place and the restoration of existing utilities damaged in the process of excavation, cutting and restoration of pavement and base courses, the furnishing and placing of select bedding, backfilling and cement or lime stabilized backfill, the hauling and disposition of surplus materials, bridging of trenches and other provisions for maintenance of traffic or access as indicated.

510.2 Materials

The Contractor shall submit descriptive information and evidence that the materials the Contractor proposes for incorporation in the Work are of the kind and quality that satisfy the requirements in the Contract Documents. Austin Water (AW) shall be included in all submittal reviews. The AW Standard Products Lists (SPLs) are considered a part of the Specifications for the Work. The Contractor shall use products from the SPLs for all water and wastewater construction unless alternative products are shown on the Drawings; called for in the specifications; or specified in the Bidding Requirements, Contract Forms and Conditions of the Contract.

The products included in the SPLs current at the time of plan approval shall govern unless a specific product or products on the lists have subsequently been removed from those SPLs because of quality or performance issues. Products and materials that are not covered by the SPLs shall meet the requirements in the contract documents.

Submittals for the products and materials covered by this specification shall include manufacturer catalog sheets, technical data sheets, shop drawings, product or material test results, requirements listed below, and any other information needed to adequately describe the product or material. For products covered by SPLs, the submittal shall include a copy of the applicable SPL with the proposed product identified. An SPL by itself is not considered an adequate submittal.

(1) Concrete

Concrete shall conform to Item No. 403S, "Concrete for Structures".

(2) Coarse Aggregate

Coarse aggregate shall conform to Item No. 403S, "Concrete for Structures" or one of the following:

(a) Pipe Bedding Stone

Pipe bedding stone shall be clean gravel, crushed gravel or crushed limestone, free of mud, clay, vegetation or other debris, conforming to ASTM C 33 for stone quality. Size gradation shall conform to ASTM C-33 No. 57 or No. 67 or the following Table:

SIEVE SIZE	% RETAINED BY WEIGHT
1½"	0
1"	0—10
½'	40—85
#4	90—100
#8	95—100

(b) Foundation Rock

Foundation rock shall be well graded coarse aggregate ranging in size from 2 to 8 inches.

(c) Flexible Base

Flexible base shall conform to Item No. 210S, "Flexible Base".

(3) Fine Aggregate

(a) Concrete and Mortar Sand

Fine aggregate shall conform to Item No. 403S, "Concrete for Structures".

(b) Bedding Sand

Sand for use as pipe bedding shall be clean, granular and homogeneous material composed mainly of mineral matter, free of mud, silt, clay lumps or clods, vegetation or debris. The material removed by decantation TxDOT Test Method Tex-406-A, plus the weight of any clay lumps, shall not exceed 4.5 percent by weight.

The resistivity shall not be less than 3000 ohms-cm as determined by TxDOT Test Method Tex-129-E. Size gradation of sand for bedding shall be as follows:

GRADATION TABLE	
SIEVE SIZE	% RETAINED BY WEIGHT
¼"	0
#60	75—100
#100	95—100

(c) Stone Screenings

Stone screenings shall be free of mud, clay, vegetation or other debris, and shall conform to the following Table:

SIEVE SIZE	% PASSING
⅜"	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

All screenings shall be the result of a rock crushing operation.

(4) Controlled Low Strength Material

Controlled Low Strength Material (CLSM) shall conform to Item 402S, "Controlled Low Strength Material.

(5) Pea Gravel

Pea gravel bedding shall be clean washed material, hard and insoluble in water, free of mud, clay, silt, vegetation or other debris. Stone quality shall meet ASTM C 33. Size gradation shall be as follows:

SIEVE SIZE	% RETAINED BY WEIGHT
¾″	0
½″	0—25
¼″	90—100

(6) Select Backfill or Borrow

This material shall consist of borrow or suitable material excavated from the trench. It shall be free of stones or rocks over 8 inches and shall have a plasticity index of less than 20. The moisture content at the time of compaction shall be within 2 percent of optimum as determined by TxDOT Test Method Tex-114-E. Sandy loam borrow will not be allowed unless shown on the Drawings or authorized by the E/A.

All suitable materials from excavation operations not required for backfilling the trench may be placed in embankments, if applicable. All unsuitable materials that cannot be made suitable shall be considered surplus excavated materials as described in 510.3(13). The Contractor may, if approved by the engineer, modify unsuitable materials to make them suitable for use. Modification may include drying, removal or crushing of over-size material, and lime or cement treatment.

(7) Cement Stabilized Backfill

When indicated or directed by the E/A, all backfill shall be with cement-stabilized backfill rather than the usual materials. Unless otherwise indicated, cement stabilized backfill material shall consist of a mixture of the dry constituents described for Class J Concrete. The cement and aggregates shall be thoroughly dry mixed with no water added to the mixture except as may be directed by the E/A.

(8) Pipe

General

Fire line leads and fire hydrant leads shall be ductile iron. Domestic water services shall not be supplied from fire service leads, unless the domestic and fire connections are on separately valved branches with an approved backflow prevention device in the fire service branch. All wastewater force mains shall be constructed of ductile iron pipe Pressure Class 250 minimum for pipe greater than 12-inch size and Pressure Class 350 for pipe 12-inch size and smaller. Wastewater pipe shall be in accordance with AW SPL WW-534 and shall have a corrosion resistant interior lining acceptable to the Owner.

All water pipe within utility easements on private property shall be Ductile Iron Pipe, Pressure Class 350 minimum for pipe 12-inch size and smaller and Pressure Class 250 minimum for pipe greater than 12-inch size wrapped as indicated. For sizes over 24 inches, Concrete Pressure Pipe, steel cylinder type, conforming to the requirements of AWWA C-301 will be acceptable.

There may be no service connections to Concrete Pressure Pipe installed in utility easements on private property. Approved service clamps or saddles shall be used when tapping ductile iron pipe 12 inch size and smaller. All service tubing (¾ inch thru 2 inches) installed in utility easements on private property shall be 150 psi annealed seamless Type K copper tubing with no sweat or soldered joints.

All reclaimed water mains shall be constructed of ductile iron pipe, Pressure Class 350 minimum for pipe 12-inch size and smaller and pressure class 250 for pipe greater than 12-inch size. For mains 12-

inch size and smaller, PVC pipe, conforming to the requirements of AWWA C-900, DR 14 shall be acceptable. Reclaimed water pipe shall be manufactured purple, painted purple, or wrapped in purple polyethylene film wrap.

Manufacturers of concrete pipe and pipe larger than 24-inch diameter shall have a quality control program consisting of one or more of the following: 1) a quality management system certified by the American National Standards Institute (ANSI) or National Sanitation Foundation (NSF) to comply with ISO 9001:2000, 2) a quality management system certified by the QCast Program following the requirements of the ACPA Plant Certification Manual, 3) a quality management system certified by the National Precast Concrete Association 4) a quality control program approved by the OWNER prior to submittal of bids for the PROJECT, or 5) an independent, third party quality control testing and inspection firm for testing and inspecting pipe produced for the PROJECT and approved by the OWNER prior to submittal of bids for the PROJECT. All such quality control programs shall be paid for by the manufacturer. It is the intent of this requirement that the manufacturer will document all appropriate tests and inspections with sampling and inspection criteria, frequency of testing and inspection, date of testing and inspection and date on which every piece was manufactured. Required testing and inspection, including that by an independent, third party, shall be performed full-time during production of pipe for the PROJECT. When requested by the OWNER, the manufacturer will provide copies of test data and results and inspection reports with the shipment of pipe for the PROJECT. Test data and results and inspection reports shall be traceable to specific pipe lots or pieces. Owner approval of the manufacturer's quality control program will expire after three years, at which time the manufacturer must present a current quality control program for approval in order to retain listing on the applicable SPL. Owner approval of the Concrete Pipe manufacturer's quality control program will expire after three years, at which time the manufacturer must present a current quality control program for approval.

The quality of materials, the process of manufacture and the finished pipe shall be subject to inspection and approval by the E/A at the pipe manufacturing plant and at the project site prior to and during installation. Plant inspections shall be conducted at the discretion of the City Representative. Only manufacturers having a quality control program of the type described above will be considered as approved providers of concrete pipe and pipe products as listed in the SPL.

All water distribution pipe and fittings shall be listed in the Fire Protection Equipment Directory published by the Underwriter's Laboratories, Inc., or shall be Factory Mutual approved for fire service. All water pipe and related products shall be registered by the National Sanitation Foundation as having been certified to meet NSF/ANSI Standard 61.

(a) Reserved

(b) Iron Pipe

Iron pipe shall be ductile iron pipe meeting all requirements of standards as follows:

-For push-on and mechanical joint pipe: AWWA C-151

-For flanged pipe: AWWA C-115

Barrels shall have a nominal thickness required by Table 1 of AWWA C-115, which thickness corresponds to Special Class 53 in sizes through 54 inch, and Class 350 in 60 and 64-inch sizes. Flanges shall be ductile iron (gray iron is not acceptable); they shall be as shown in ANSI/AWWA C115/A21.15 and shall conform to dimensions shown in Table 2 and Figure 1 of AWWA C115. These flanges are the same in all respects as flanges shown in ANSI/AWWA C110/A21.10 for fittings and are standard for all flanges used with pipe, valve, and equipment units in the COA water distribution and wastewater force main systems. Flanges shall be fabricated and attached to the pipe barrels by U.S. fabricators using flanges and pipe barrels of U.S. manufacture. If fabrication is to be by other than the pipe barrel

manufacturer, a complete product submittal and approval by AW will be required. Additionally, such fabricator shall furnish certification that each fabricated joint has been satisfactorily tested hydrostatically at a minimum pressure of 300 psi.

-Linings and Coating:

Interior surfaces of all iron potable or reclaimed water pipe shall be cement-mortar lined and seal coated as required by AWWA C104. Interior surfaces of all iron wastewater line and force main pipe shall be coated with a non-corrosive lining material as indicated on AW SPL WW-534. Pipe exteriors shall be coated as required by the applicable pipe specification. The type and brand of interior lining shall be clearly marked on the outside of the pipe and fittings. Except as authorized by the E/A, only one type and brand of pipe lining shall be used on a given project.

Except as described above for flanged pipe (Thickness Class 53) and where not otherwise indicated, ductile iron pipe shall be minimum Class 250 as defined by ANSI/AWWA C150/A21.50-current; all ductile iron pipe and flanges shall meet the following minimum physical requirements:

Grade 60-42-10:

-Minimum tensile strength: 60,000 psi (414 mPa).

-Minimum yield strength: 42,000 psi (290 mPa).

-Minimum elongation: 10 percent.

The flanges for AWWA C115 pipe may be also be made from:

Grade 70-50-05:

-Minimum tensile strength: 70,000 psi (483 mPa).

-Minimum yield strength: 50,000 psi (345 mPa).

-Minimum elongation: 5 percent.

1. Ductile Iron Fittings:

   Fittings shall be push-on, flanged or mechanical joint as indicated or approved and shall meet all requirements of standards as follows:

   -Sizes 4 inch through 24 inch: AWWA C-110 or AWWA C-153

   -Sizes larger than 24 inch: AWWA C-110.

   -Lining and Coating:

   Interior surfaces or all iron potable/reclaimed water pipe fittings shall be lined with cement- mortar and seal coated as required by AWWA C104. Interior surfaces of all iron wastewater and force main fittings shall be coated with a non-corrosive lining material acceptable to Owner. Fitting exteriors shall be coated as required by the applicable pipe specification.

2. Joint Materials

   Gaskets for mechanical joints shall conform to ANSI/AWWA A21.11/C-111.

   Joining of slip joint iron pipe shall, without exception, be accomplished with the natural or synthetic rubber gaskets of the manufacturer of that particular pipe being used. A joint lubricant shall be used and applicable recommendations of the manufacturer shall be followed.

Gaskets for flanged joints shall be continuous full face gaskets, of ⅛ inch minimum thickness of natural or synthetic rubber, cloth-reinforced rubber or neoprene material, of deformed cross section design and shall meet all applicable requirements of ANSI/AWWA A21.11/C-111 for gaskets. They shall be manufactured by, or satisfy all recommendations of, the manufacturer of the pipe/fittings being used and be fabricated for use with Class 125 ANSI B16.1 flanges.

Tee-head bolts, nuts and washers for mechanical joints shall be high strength, low alloy, corrosion resistant steel stock equal to "COR-TEN A" having UNC Class 2 rolled threads or alloyed ductile iron conforming to ASTM A 536; either shall be fabricated in accordance with ANSI/AWWA A21.11/C-111.

Hex head bolts and nuts shall satisfy the chemical and mechanical requirements of ASTM A449 SAE Grade 5 plain, and shall be fabricated in accordance with ASTM B 18.2 with UNC Class 2 rolled threads.

Either Tee-Head or Hex-Head bolts, nuts and washers as required, shall be protected with bonded fluoro-polymer corrosion resistant coating where specifically required by the E/A.

All threaded fasteners shall be marked with a readily visible symbol cast, forged or stamped on each nut and bolt, which will identify the fastener material and grade. The producer and the supplier shall provide adequate literature to facilitate such identification; painted markings are not acceptable.

3. Polyethylene Film Wrap

All iron pipe, fittings and accessories shall be wrapped with standard 8 mil (minimum) low density polyethylene film or 4-mil (minimum) cross laminated high-density polyethylene conforming to AWWA C-105, with all edges overlapped and taped securely with duct tape to provide a continuous wrap to prevent contact between the piping and the surrounding backfill. Repair all punctures of the polyethylene, including those caused in the placement of bedding aggregates, with duct tape to restore the continuous protective wrap before backfilling. Polyethylene film wrap for reclaimed water pipe shall be purple.

4. Marking

Each pipe joint and fitting shall be marked as required by the applicable AWWA specification. This includes in all cases: Manufacturer's identification, Country where cast, year of casting, and "DUCTILE" or "DI". Barrels of flanged pipe shall show thickness class; others shall show pressure class. The flanges of pipe sections shall be stamped with the fabricators identification; fittings shall show pressure rating, the nominal diameter of openings and the number of degrees for bends. Painted markings are not acceptable.

5. Warning Tape

Warning tape for identifying restrained joint pipe and fittings shall be yellow and shall have black lettering at least 2inches high that reads "Restrained Joint / Junta de Restriccion" at intervals not exceeding 24 inches. The warning tape shall be polypropylene having a minimum thickness of 2 mils, a minimum width of 3 inches, and adhesive backing on the side opposite the lettering.

(c) Concrete

1. General

Pipe shall conform to ASTM C 76 for Circular Pipe. Concrete pipe smaller than 12 inches in diameter shall conform to ASTM C 14, Extra Strength. All pipe shall be machine made or cast by a process which will provide uniform placement of the concrete in the form and

compaction by mechanical devices, which will assure a dense concrete. Concrete shall be mixed in a central batch plant or other approved batching facility from which the quality and uniformity of the concrete can be assured. Transit mixed concrete shall not be acceptable for use in precast pipe. The pipe shall be Class III or the class indicated. Storm sewer pipe shall be of the tongue and groove or 0-ring joint design. Wastewater pipe shall be of the 0-ring joint design; it shall be acceptably lined for corrosion protection.

2. Marking

   Each joint of pipe shall be marked with the pipe class, the date of manufacture, the manufacturer's name or trade mark, diameter of pipe and orientation, if required.

   Pipe marking shall be waterproof and conform to ASTM C 76.

3. Minimum Age for Shipment

   Pipe shall be considered ready for shipment when it conforms to the tests specified in ASTM C 76.

4. Joint Materials

   When installing storm sewers (or storm drains), the Contractor shall have the option of using joints with preformed flexible joint sealants or with rubber gaskets. Preformed flexible joint sealants for storm drain joints shall comply with ASTM C990, and rubber gaskets for storm drain joints shall comply with ASTM C 1619. Mortar shall not be used to seal pre-fabricated joints. Pipe manufacturer shall be responsible for submitting to the Owner a detailed design of the joint upon request. The pipe manufacturer shall be responsible for submitting to the Owner a complete list of joint sizes showing the minimum size of material to be used with each size joint, along with complete instructions on recommended installation procedures. Quality control testing at the manufacturing plant shall be in accordance with TxDOT Departmental Materials Specifications (DMS) 7310, "Reinforced Concrete Pipe And Machine-Made Precast Concrete Box Culvert Fabrication And Plant Qualification". The pipe manufacturer shall be verified as compliant with TxDOT DMS 7310 at time of pipe delivery to the jobsite.

   a. Mortar

      Mortar for joints shall meet the requirements set forth below in "Mortar".

   b. Cold Applied Preformed Plastic Gaskets

      Cold Applied Plastic Gaskets shall be suitable for sealing joints of tongue and groove concrete pipe. The gasket sealing the joint shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler and shall contain no solvents, irritating fumes or obnoxious odors. The gasket joint sealer shall not depend on oxidizing, evaporating or chemical action for its adhesive or cohesive strength and shall be supplied in extruded rope form of suitable cross section. The size of the plastic gasket joint sealer shall be in accordance with the manufacturer's recommendations and sufficient to obtain squeeze-out around the joint. The gasket joint sealer shall be protected by a suitable removable wrapper that may be removed longitudinally without disturbing the joint sealer to facilitate application.

      The chemical composition of the gasket joint sealing compound as shipped shall meet the following requirements:

Composition (% by weight)	Test Method	Typical Analysis

Bitumen (petroleum plastic content)	ASTM D 4	50-70
Ash-inert Mineral Water	Tex-526-C	30-50
Volatile Matter (at 325 F)	Tex-506-C	2.0 Maximum

The gasket joint sealing compound when immersed for 30 days at ambient room temperature separately in 5 percent solution of caustic potash, a mixture of 5 percent hydrochloric acid, a 5 percent solution of sulfuric acid and a saturated H2S solution shall show no visible deterioration.

The physical properties of the gasket joint sealing compound as shipped shall meet the following requirements:

Property	Test Method	Typical Analysis	
		Minimum	Maximum
Specific Gravity at 77 F	ASTM D 71	1.20	1.35
Ductility at 77F (cm) Minimum	Tex-503-C	5.0	
Softening point	Tex-505-C	275 F	
Penetration:			
32 F (300 g) 60 sec	Tex-502-C	75	
77 F (150 g) 5 sec	Tex-502-C	50	120
115 F (150 g) 5 sec	Tex-502-C		150
Flashpoint C.O.C. F	Tex-504-C	600 F	
Fire Point C.O.C. F	Tex-504-C	625 F	

When constructing wastewater lines, the Contractor shall use 0-ring gasket joints conforming to ASTM C 443. Just before making a joint, the ends of the pipe shall be clean, dry, free of blisters or foreign matter and shall be wire brushed. For O-ring joints, the gasket and the inside surface of the bell shall be lubricated with a light film of soft vegetable soap compound to facilitate assembly of the joint. The rubber O-ring gasket shall be stretched uniformly in the joint. Wedge seal type ("Forsheda" pre-lubricated) gaskets may be used if joint details submitted are approved; installation of such gaskets shall be in strict accordance with the manufacturer's recommendations, and shall be the sole element depended upon to make the joint flexible and watertight.

In wastewater lines no horizontal or vertical angles in the alignment of pipes shall be permitted unless indicated. The spigot shall be centered in the bell, the pipe pushed uniformly home and brought into true alignment. Bedding material shall be placed and tamped against pipe to secure the joint.

5. Bends

When horizontal or vertical angles in the alignment of storm sewers are indicated, the bend or angle shall be constructed by cutting on a bias one or both pipes as may be required for the alignment indicated. The pipe cut shall be sufficiently long to allow exposing the reinforcement, which shall be bent, welded and incorporated into the pipe bend and reinforced concrete collar to maintain the structural integrity. The collar shall be 6 inches minimum, reinforced with #4 bars on a 1 foot center both directions. Builder's hardware cloth may be used on the outside of the joint to aid in holding cementing materials in place. Plywood, fiberboard or other materials placed on the inside of the pipe as formwork shall be removed as soon as the joint materials have obtained initial set, after

which the inside surface of the pipe joint shall be finished smooth and true to the line and grade established. The Contractor may use prefabricated bends meeting the specification requirements in lieu of field fabricated bends. All bends shall be watertight, have a smooth flow line and be equal or greater in strength to the adjacent pipe.

Horizontal or vertical changes in alignment in wastewater lines shall be accomplished by use of manholes. With the E/A's approval, horizontal changes in alignment may be made by the "Joint Deflection" method. Joint deflection is limited by regulations of the Texas Commission on Environmental Quality (TCEQ) to 80 percent of the maximum recommended by the manufacturer; such deflection may not exceed 5 degrees at any joint. Changes in alignment using pipe flexure shall not be allowed.

6. Sulfide and Corrosion Control

All concrete pipe used for wastewater installations shall be protected from sulfide and corrosion damage by using limestone aggregate.

(d) Concrete Steel Cylinder (CSC) Pipe

1. General Requirements

The Contractor shall submit to the E/A for approval along with other required data a tabulated layout schedule with reference to the stationing and grade lines to be used.

The manufacturer shall furnish all fittings and special pieces required for closures, bends, branches, manholes, air valves, blow offs and connections to main line valves and other fittings as indicated.

Each pipe length, fitting and special joint shall have plainly marked on the bell end of the pipe, the head condition for which it is designed. In addition, marking shall be required to indicate the location of each pipe length or special joint in the line and such markings will be referenced to the layout schedules and drawings and submitted for approval.

Concrete steel cylinder fittings shall be tested as required by the applicable AWWA Standards.

2. Design and Inspection

Where not otherwise indicated, concrete steel cylinder pipe shall be Class 150, designed to withstand a vacuum of not less than 28 feet of water. Valve reducers, tees and outlets from a pipe run shall be designed and fabricated so that all stresses are carried by the steel forming the fitting or outlet.

Concrete steel cylinder pipe shall meet one of the following specifications:

AWWA C-301 - Any Size

AWWA C-303 - 24-inch maximum size

All pipe flanges shall conform to AWWA C-207, requirements for standard steel flanges of pressure classes corresponding to the pipe class.

Pipe to be installed in a tunnel or encasement shall be manufactured with 1 inch thick by 24-inch wide skid bands of mechanically impacted mortar in addition to the normal coating.

All concrete steel cylinder fittings shall be constructed of steel plate of adequate strength to withstand both internal pressure and external loading. Rod reinforcing shall not be used to figure the required steel area. The fittings shall have a concrete lining and 1 inch

minimum coating of cement mortar, except that centrifugally spun lining need not be reinforced.

Minimum lining thickness shall be ½ inch for 16-inch pipe and ¾ inch for sizes larger than 16-inch pipe. Where it is impractical to place such concrete protection on interior surfaces of small outlets, 2 coats of "Bitumastic Tank Solution" shall be applied.

No fitting shall be made by cutting of standard pipe, except that outlets of less than 75 percent of the pipe diameter may be placed in a standard pipe. Beveled spigots may be placed on standard pipe.

3. Joint Materials

Joints shall be of the rubber gasket type conforming to the applicable standards. The inside and outside recesses between the bell and spigot shall be completely filled with Cement Grout in accordance with the pipe manufacturer's recommendations. Grout materials for jointing such pipe, unless otherwise indicated, shall be as described herein.

(e) Reserved

(f) Polyethylene (PE) Pressure Pipe, Fittings, and Tubing

1. General

PE pressure pipe, fittings and tubing shall be Designation PE4710 and shall meet or exceed a cell classification of 445574 per ASTM D3350.

2. Pipe

PE pipe (4-inch and larger) used for pressure applications shall conform to the material requirements specified in AWWA C906. PE pipe shall be ductile iron pipe size (DIPS) outside diameter and minimum Pressure Class 200 (DR 11). Pipe manufacturers shall be listed on SPL WW-706.

3. Fittings

PE fittings (4-inch and larger) used for pressure applications shall conform to the material requirements specified in AWWA C906. PE fittings shall be ductile iron pipe size (DIPS) outside diameter and minimum Pressure Class 200 (DR 11, or Equivalent Dimension Ratio (EDR) 11 for fabricated fittings). Fitting manufacturers shall be listed on SPL WW-706A, WW-706B or WW-706C.

4. Tubing

PE tubing (3-inch and smaller) shall conform to material requirements specified in AWWA C901 and meet the requirements of ASTM D2737. PE tubing shall be copper tubing size (CTS) outside diameter and minimum Pressure Class 250 (DR 9). Tubing manufacturers shall be listed on SPL WW-65, WW-65A, or WW-65C.

(g) Copper Tubing

All copper service tubing shall be annealed seamless Type K water tube meeting ASTM B88 and rated at 150 psi working pressure. The tubing shall be homogenous throughout and free from cracks, holes, crimping, foreign inclusions or other defects. It shall be uniform in density and other physical properties. Copper tubing for reclaimed water shall be wrapped in purple polyethylene film wrap. Pipe manufacturers shall be listed on SPL WW-613.

(h) Service Connection Fittings

All fittings used in customer service connection - tapping mains, connecting meters, etc. - must be currently listed on the applicable AW SPL WW-68, or called for in the COA Standards (520 - series).

(i) Brass Goods

All brass valves, couplings, bends, connections, nipples and miscellaneous brass pipe fittings and accessories used in meter connections, service lines, air release piping assemblies, and wherever needed in the water distribution system, shall conform to the COA Standards, AW SPL, and AWWA C-800, except as herein modified or supplemented.

Unless otherwise noted, the goods described herein shall be fabricated of standard Red Brass (Waterworks Brass) meeting ASTM B62 or B584, alloy 83600, consisting of 85 percent copper and 5 percent each of tin, lead and zinc.

Exposed threads shall be covered with plastic caps or sheeting to protect the threads.

Brass goods of each type and class shall be compatible with other fittings in common usage for similar purposes. Where not otherwise indicated, all such materials shall meet the following requirements:

Inlet threads of corporation valves shall be AWWA iron pipe (IP) thread (male); outlets of service saddles shall be tapped with AWWA IP thread (female). AWWA IP threads shall conform to ANSI/ASME B1.20.1 as required by AWWA C800 for "General Purpose (Inch) Pipe Threads". For ¾" and 1" sizes only, corporation valve inlet threads, and the internal threads of saddles may be the AWWA taper thread conforming to AWWA C800 Figure 1 and Table 6. External threads of corporation valve inlet must be compatible with internal threads of the service saddle.

Connections of all new tubing, and of tubing repairs wherever possible, shall be by compression fittings. Compression connections shall be designed to provide a seal and to retain the tubing, without slippage, at a working water pressure of 150 psig.

Flanges shall conform to ANSI B16.1, Class 125, as to dimensions, drillings, etc. Copper tubing, when used, shall be Type K tubing having dimensions and weights given in Table A.1 of AWWA C800.

Brass pipe shall conform to the weights and dimensions for Extra Strong pipe given in Table A.2 of AWWA C800.

All fittings shall be suitable for use at hydrostatic working pressures up to 150 psig (hydrostatic testing of installed systems is at 200 psig).

(j) Reserved

(k) Polyvinyl Chloride Potable/Reclaimed Water Pipe

1. General

All polyvinyl chloride (PVC) potable/reclaimed water pipe shall be of the rigid (UNPLASTICIZED) type and must bear the National Sanitation Foundation seal of approval for potable water pipe. Each joint of pipe shall consist of single continuous extrusion; bells or other components attached by solvent welding are not acceptable. Pipe shall be pressure rated at 200 psi (SDR-14).

Pipe shall have push-on, rubber gasket joints of the bell and spigot type with thickened integral bells with rubber gasket joints. The wall thickness of each pipe bell and joint coupling must be greater than the standard pipe barrel thickness. Clearance must be provided in every gasket joint for both lateral pipe deflection and for linear expansion and contraction. Concrete support cradles or blocking shall be required for support of all fire

hydrants, valves and AWWA C110 fittings; such support shall be provided for AWWA C153 fittings when required by the E/A.

Pipe with a whitened exterior (fading of color) that was manufactured more than 2 years before the proposed installation date shall be rejected.

2. Applicable Specifications

Except as modified or supplemented herein, PVC pipe shall meet the following standards:

AWWA C-900, or SDR 14 for PVC Pressure Pipe, in 4, 6, 8 and 12 inch nominal sizes, having Cast Iron Pipe size outside diameters.

Fittings used with PVC Pressure pipe shall be AWWA C-110 or AWWA C-153 compact ductile iron fittings.

All pipe 4 inches and larger must be approved Underwriter's Laboratories for use in buried water supply and fire protection systems.

3. Material Requirements

All pipe and fittings shall be made from clean, virgin, NSF certified, Class 12454 PVC. Clean reworked materials generated from the manufacturers own production may be used within the current limits of the referenced AWWA C-900.

4. Marking

PVC for reclaimed piping shall be purple or wrapped in purple polyethylene film wrap.

Permanent marking on each joint of pipe shall include the following at intervals of not more than 5 feet:

Nominal pipe size and OD base (e.g., 4 CIPS).

Type of plastic material (e.g., PVC 12454).

Standard Dimension Ratio and the pressure rating in psi for water at 73 F (e.g., SDR 18, 150 psi).

AWWA designation with which the pipe complies (e.g., AWWA C-900).

Manufacturer's name or code and the National Sanitation Foundation (NSF) mark.

5. Tracer Tape

Inductive Tracer Detection Tape shall be placed directly above the centerline of all non-metallic pipe a minimum of 12 inches below subgrade or, in areas outside the limits of pavement, a minimum of 18 inches below finished grade. The tracer tape shall be encased in a protective, inert, plastic jacket and color coded according to American Public Works Association Uniform Color Code. Except for minimum depth of cover, the tracer tape shall be placed according to manufacturer's recommendations. Manufacturers must be listed on SPL WW-597.

(l) Polyvinyl Chloride (PVC) Pipe (Nonpressure) and Fittings

1. General

PVC sewer and wastewater pipe and fittings 6 through 15 inch diameter shall conform to ASTM D 3034. Pipe shall have minimum cell classification of 12364 or 12454. Fittings shall have cell classification of 12454 or 13343. Pipe stiffness shall be at least 115 psi as determined by ASTM D 2412. Pipe manufacturers shall be on SPL WW-227, and fitting manufacturers shall be on SPL WW-227B.

PVC sewer and wastewater pipe and fittings 18 through 27 inch diameter shall conform to ASTM F 679. Pipe shall have minimum cell classification of 12364 or 12454. Pipe stiffness shall be at least 72 psi as determined by ASTM D 2412. Pipe manufacturers shall be on SPL WW-227A, and fitting manufacturers shall be on SPL WW-227B.

Pipe with a whitened exterior (fading of color) that was manufactured more than 2 years before the proposed installation date shall be rejected.

2. Joints

   PVC pipe and fitting shall have elastomeric gasket joints conforming to ASTM D 3212. Gaskets shall conform to ASTM F 477.

3. Pipe Markings

   Pipe meeting ASTM D 3034 shall have permanent marking on the pipe that includes the following at intervals of not more than 5 feet:

   Manufacturer's name and/or trademark and code.

   Nominal pipe size.

   PVC cell classification per ASTM D 1784.

   The legend "SDR-_ _ PVC Sewer Pipe" (SDR 26, 23.5. or less is required)

   The designation "ASTM D 3034"

   Pipe meeting ASTM F 679 shall have permanent marking that includes the following at intervals of not more than 5 feet:

   Manufacturer's name or trademark and code

   Nominal pipe size

   PVC cell classification per ASTM D 1784

   Pipe stiffness designation "PS _ _ PVC Sewer Pipe" (PS of at least 72 is required

   The designation "ASTM F 679"

4. Fitting Markings

   Fittings meeting ASTM D 3034 shall have permanent marking that includes the following:

   Manufacturer's name or trademark

   Nominal size

   The material designation "PVC"

   The designation, "ASTM F 679"

   Fittings meeting ASTM F 679 shall have permanent marking that includes the following:

   Manufacturer's name or trademark and code

   Nominal size

   The material designation "PVC"

   The designation "ASTM F 679"

5. Tracer Tape

Inductive Tracer Detection Tape shall be placed directly above the centerline of all non-metallic pipe a minimum of 12 inches below subgrade or, in areas outside the limits of pavement, a minimum of 18 inches below finished grade. The tracer tape shall be encased in a protective, inert, plastic jacket and color coded according to American Public Works Association Uniform Color Code. Except for minimum depth of cover, the tracer tape shall be placed according to manufacturer's recommendations. Manufacturers must be listed on SPL WW-597.

(m) Steel Pipe

1. Standard Weight

   ASTM A 53, Schedule 40.

2. Extra Heavy Weight

   Seamless ASTM A 53, Schedule 80.

3. Encasement Pipe

   a. For direct-bury installations, pipe shall conform to ASTM A134 with minimum thickness of 3/8 inch (9.5 mm).

   b. For jacked installations, pipe shall conform to requirements on drawings.

4. Fittings

   Nipples and fittings extra strong Federal Specification WW-N 351 or WW-P 521.

5. Coatings

   Black or galvanized as indicated.

(n) Welded Steel Pipe and Fittings for Water-Pipe

1. General Reference Standards Specification.

   Specifications of the American Water Works Association (AWWA) listed below shall apply to this Section.

   C-200 Steel Water Pipe 6 inches and larger.

   C-205 Cement-Mortar Protective Lining and Coating for Steel Water Pipe, 4 inches and larger, Shop Applied.

   C-206 Field Welding of Steel Water Pipe.

   C-207 Steel Pipe Flanges for Waterworks Services, Sizes 4 inches through 144 inches.

   C-208 Dimensions for Steel Water Pipe Fittings.

   C-602 Cement-Mortar Lining of Water Pipelines, 4 inches and larger in Place.

2. Submittals

   Furnish Shop Drawings, product data, design calculations and test reports as described below:

   a. Certified copies of mill tests confirming the type of materials used in steel plates, mill pipe flanges and bolts and nuts to show compliance with the requirements of the applicable standards.

   b. Complete and dimensional working drawings of all pipe layouts. Shop Drawings shall include the grade of material, size, wall thickness of the pipe and fittings,

type and location of fittings and the type and limits of the lining and coating systems of the pipe and fittings.

c. Product data to show compliance of all couplings, supports, fittings, coatings and related items.

3. Job Conditions

a. The internal design pressure of all steel pipe and fittings shall be as indicated.

b. The interior of all steel pipe for potable water, 4 inches and larger, shall be cement-mortar lined.

4. Manufacturing

a. Description

Pipe shall comply with AWWA C-200.

(1) Circumferential deflection of all pipe in-place shall not exceed 2.0 percent of pipe diameter.

(2) Diameter

Nominal pipe diameter shall be the inside diameter of lining or pipe barrel, unless otherwise designated in Job Conditions.

b. Wall Thickness

(1) Steel pipe wall thickness shall be designed for the internal and external loads specified in this section. The cylinder thickness needed to resist internal pressure shall be based on an allowable stress in the steel equal to ½ the minimum yield stress of the material used.

5. Fittings

a. Welded

Fabricated steel fittings shall be of the same material as pipe and shall comply with AWWA C-208.

6. Flanges

a. Flanges shall comply with the requirements of AWWA C-207, Class D or Class E. The class shall be based on operating conditions and mating flanges of valves and equipment.

b. Gaskets shall be cloth-inserted rubber, ⅛ inch thick.

c. Flanges shall be flat faced with a serrated finish.

7. Pipe Joints

a. Lap Joints for Field Welding

(1) Lap joints for field welding shall conform to AWWA C-206. This item applies only to pipes 72 inches in diameter and larger.

(2) The bell ends shall be formed by pressing on a hydraulic expander or a plug die. After forming, the minimum radius of curvature of the bell end at any point shall not be less than 15 times the thickness of the steel shell. Bell ends shall be formed in a manner to avoid impairment of the physical properties of the steel shell. Joints shall permit a lap at least 1 ½

inches when assembled. The longitudinal or spiral weld on the inside of the bell end and the outside of the spigot end on each section of pipe shall be ground flush with the plate surface. The inside edge of the bell and the outside edge of the spigot shall be scarfed or lightly ground to remove the sharp edges or burrs.

b. Bell and Spigot Joints with O-Ring Gasket

(1) Bell and spigot joints with rubber gasket shall conform to AWWA C-200.

(2) The bell and spigot ends shall be so designed that when the joint is assembled, it will be self-centered and the gasket will be confined to an annular space in such manner that movement of the pipe or hydrostatic pressure cannot displace it. Compression of the gasket when the joint is completed shall not be dependent upon water pressure in the pipe and shall be adequate to ensure a watertight seal when subjected to the specified conditions of service. Bell and spigot ends shall be welded on preformed shapes. The bell and spigot ends shall conform to the reviewed Shop Drawings.

8. Interior and Exterior Protective Surface Coatings

a. Exterior Surface to be mortar coated shall conform to AWWA C-205 for shop application and AWWA C-602 for field application. Pipe materials shall be the product of an organization, which has had not less than 5 years successful experience manufacturing pipe materials, and the design and manufacture of the pipe, including all materials, shall be the product of one company.

b. All surfaces except as noted in c and d below shall receive shop application of mortar lining and coating.

c. Field Welded Joints. After installation, clean, line and coat unlined or uncoated ends adjacent to welded field joints, including the weld proper, as specified for pipe adjacent to the weld. Potable water only shall be used in the preparation of any cement, mortar, or grout lining.

d. Machined Surfaces. Shop coat machined surfaces with a rust preventative compound. After jointing surfaces, remaining exposed surfaces shall be coated per a) and b) above.

(o) Corrugated Metal Pipe

1. General

Pipe shall be corrugated continuous lock or welded seam helically corrugated pipe. Corrugated metal pipe may be galvanized steel, aluminized steel or aluminum conforming to the following:

Galvanized Steel AASHTO M 218

Aluminized Steel AASHTO M 274

Aluminum AASHTO M 197

Where reference is made herein to gage of metal, the reference is to U.S. Standard Gage for uncoated sheets. Tables in AASHTO M 218 and AASHTO M 274 list thickness for coated sheets in inches. The Tables in AASHTO M 197 list thickness in inches for clad aluminum sheets.

Sampling and testing of metal sheets and coils used for corrugated metal pipe shall be in accordance with TXDOT Test Method Tex-708-I.

Damaged spelter coating shall be repaired by thoroughly wire brushing the damaged area and removing all loose, cracked or weld-burned spelter coating. The cleaned area shall be painted with a zinc dust-zinc oxide paint conforming to Federal Specifications TT-P 641b. Damaged pipe shall be rejected and removed from the project.

Damaged aluminized coating shall be repaired in accordance with the manufacturer's recommendations.

The following information shall be clearly marked on each section of pipe:

Thickness and corrugations

Trade Mark of the manufacturer

Specification compliance

2. Fabrication

a. Steel Pipe

Galvanized or aluminized steel pipe shall be full circle or arch pipe conforming to AASHTO M 36, Type I or Type II as indicated.

It may be fabricated with circumferential corrugations; lap joint construction with riveted or spot welded seams or it may be fabricated with helical corrugations with continuous helical lock seam or ultra high frequency resistance butt-welded seams.

b. Aluminum Pipe

Pipe shall conform to AASHTO M 196, Type I, circular pipe or Type II, pipe arch as indicated. It may be fabricated with circumferential corrugations; lap joint construction with riveted or spot welded seams or it may be fabricated with helical corrugations with a continuous helical lock seam.

Portions of aluminum pipe that are to be in contact with high chloride concrete or metal other than aluminum, shall be insulated from these materials by a coating of bituminous material. The coating applied to the pipe or pipe arch to provide insulation between the aluminum and other material shall extend a minimum distance of 1 foot beyond the area of contact.

3. Selection of Gages

The pipe diameter, permissible corrugations and required gauges for circular pipe shall be as indicated on the drawings.

For pipe arch, the span, rise, gage, corrugation size and coating thickness shall be as shown on the drawings. A tolerance of plus or minus 1 inch or 2 percent of equivalent circular diameter, whichever is greater, will be permissible in span and rise, with all dimensions measured from the inside crests of the corrugations.

4. Joint Material

Except as otherwise indicated, coupling bands and other hardware for galvanized or aluminized steel pipe shall conform to AASHTO M 36 for steel pipe and AASHTO M 196 for aluminum pipe. Field joints for each type of corrugated metal pipe shall maintain pipe alignment during construction and prevent infiltration of soil material during the life of the installation.

Coupling bands shall be not more than 3 nominal sheet thickness lighter than the thickness of the pipe to be connected and in no case lighter than 0.052 inch for steel or 0.048 inch for aluminum.

Coupling bands shall be made of the same base metal and coating (metallic or otherwise) as the pipe.

Coupling bands shall lap equally on each of the pipes being connected to form a tightly closed joint after installation.

Pipes furnished with circumferential corrugations shall be field jointed with corrugated locking bands. This includes pipe with helical corrugations, which has reformed circumferential corrugations on the ends. The locking bands shall securely fit into at least one full circumferential corrugation on each of the pipe ends being coupled. The minimum width of the corrugated locking bands shall be as shown below for the corrugation which corresponds to the end circumferential corrugations on the pipes being joined:

10½ inches wide for 2⅔ inches × ½-inch corrugations.

12 inches wide for 3 inches × 1 inch or 5 inches × 1-inch corrugations.

Helical pipe without circumferential end corrugations will be permitted only when it is necessary to join a new pipe to an existing pipe, which was installed with no circumferential end corrugations. In this event pipe furnished with helical corrugations at the ends shall be field jointed with either helically corrugated bands or with bands with projections or dimples. The minimum width of helically corrugated bands shall conform to the following:

12 inches wide for pipe diameters up to and including 72 inches.

14 inches wide for 1 inch deep helical end corrugations.

Bands with projections shall have circumferential rows of projections with one projection for each corrugation. The width of bands with projections shall be not less than the following:

12 inches wide for pipe diameters up to and including 72 inches.

The bands shall have 2 circumferential rows of projections.

16¼ inches wide for pipe diameters of 78 inches and greater.

The bands shall have 4 circumferential rows of projections.

Unless otherwise indicated, all bolts for coupling bands shall be ½-inch diameter. Bands 12 inches wide or less shall have a minimum of 2 bolts and bands greater than 12 inches wide shall have a minimum of 3 bolts.

Galvanized bolts may be hot dip galvanized conforming to AASHTO M 232, mechanically galvanized to provide the same requirements as AASHTO M 232 or electro-galvanized per ASTM A 164 Type RS.

5. Additional Coatings or Linings

    a. Bituminous Coated

    Bituminous Coated pipe or pipe arch shall be as indicated both as to base metal and fabrication and in addition shall be coated inside and out with a bituminous coating which shall meet the performance requirements set forth herein. The bituminous coating shall be 99.5 percent soluble in carbon bisulphide. The pipe shall be uniformly

coated inside and out to a minimum thickness of 0.05 inch, measured on the crests of the corrugations.

The bituminous coating shall adhere to the metal tenaciously, shall not chip off in handling and shall protect the pipe from deterioration as evidenced by samples prepared from the coating material successfully meeting the Shock Test and Flow Test in accordance with Test Method Tex-522-C.

b. Paved Invert

Where a Paved Invert is indicated, the pipe or pipe arch, in addition to the fully coated treatment described above, shall receive additional bituminous material of the same specification as above, applied to the bottom quarter of the circumference to form a smooth pavement with a minimum thickness of ⅛ inch above the crests of the corrugations.

c. Cement Lined

(1) General

Except as modified herein, pipe shall conform to AASHTO M 36 for lock seam or welded helically corrugated steel pipe. Pipe shall be of full circle and shall be fabricated with two annular corrugations for purposes of joining pipes together with band couplers. Lock seams shall develop the seam strength as required in Table 3 of AASHTO M 36. Concrete lining shall conform to the following:

Composition

Concrete for the lining shall be composed of cement, fine aggregate and water that are well mixed and of such consistency as to produce a dense, homogeneous, non-segregated lining.

Cement

Portland Cement shall conform to AASHTO M 85.

Aggregate

Aggregates shall conform to AASHTO M 6 except that the requirements for gradation and uniformity of gradation shall not apply.

Mixture

The aggregates shall be sized, graded, proportioned and thoroughly mixed with such proportions of cement and water as will produce a homogenous concrete mixture of such quality that the pipe will conform to the design requirements indicated. In no case, however, shall the proportions of Portland Cement, blended cement or Portland Cement plus pozzolanic admixture be less than 470 lb/cu. yd of concrete.

Thickness

The lining shall have a minimum thickness of ⅛ inch above the crest of the corrugations.

Lining Procedures

The lining shall be plant applied by a machine traveling through a stationary pipe. The rate of travel of the machine and the rate of

concrete placement shall be mechanically regulated so as to produce a homogenous nonsegregated lining throughout.

Surface Finish

The lining machine shall also mechanically trowel the concrete lining as the unit moves through the pipe.

Certification

Furnish manufacturer's standard certification of compliance upon request of the purchaser.

Joints

Pipe shall be joined together with coupling bands made from steel sheets to an indicated thickness of 0.064 inch (12 ga.). Coupling bands shall be formed with two corrugations that are spaced to provide seating in the third corrugation of each pipe end without creating more than ½ inch ± annular space between pipe ends when joined together.

Bands shall be drawn together by two ½ inch galvanized bolts through the use of a bar and strap suitably welded to the band.

When O-ring gaskets are indicated they shall be placed in the first corrugation of each pipe and shall be compressed by tightening the coupling band. Rubber O-ring gaskets shall conform to Section 5.9, ASTM C 361.

(2) Causes for Rejection

Pipe shall be subject to rejection on account of failure to conform to any of the indications. Individual sections of pipe may be rejected because of any of the following:

Damaged ends, where such damage would prevent making satisfactory joint.

Defects that indicate poor quality of work and could not be easily repaired in the field.

Severe dents or bends in the metal itself.

If concrete lining is broken out, pipe may be rejected or at the discretion of the E/A, repaired in the field in accordance with the manufacturer's recommendation.

Hairline cracks or contraction cracks in the concrete lining are to be expected and does not constitute cause for rejection.

d. Fiber Bonded

Where fiber bonded pipe is indicated, the pipe or pipe arch shall be formed from sheets whose base metal shall be as indicated. In addition, the sheets shall have been coated with a layer of fibers, applied in sheet form by pressing them into a molten metallic bonding. If a paved invert is indicated it shall be in accordance with the procedure outlined above. The test for spelter coating above is waived for fiber bonded pipe.

6. Slotted Drain Storm Sewers

The pipes for the slotted drain and slotted drain outfall shall be helically corrugated, lock seam or welded seam pipe. Materials and fabrication shall be in accordance with the above. The metal thickness shall be a minimum 16 gage.

The chimney assemblies shall be constructed of 3/16 inch welded plate or machine formed 14 gage galvanized steel sheets. The height of the chimney required shall be as indicated. Metal for the welded plate slot shall meet the requirements of ASTM A 36 and the completed plate slot shall be galvanized after fabrication in accordance with ASTM A 123.

Weld areas and the heat affected zones where the slot is welded to the corrugated pipe shall be thoroughly cleaned and painted with a good quality asphalt base aluminum paint.

7. Mortar

Mortar shall be composed of 1 part Type I Portland Cement and 2 parts clean, sharp mortar sand suitably graded for the purpose and conforming in other respects to the provisions for fine aggregate of Item No. 403, "Concrete for Structures". Hydrated lime or lime putty may be added to the mix, but in no case shall it exceed 10 percent by weight of the total dry mix.

(9) Geotextile Filter Fabric for Pipe Bedding Material

Geotextile filter fabric for pipe bedding material shall be Hanes Geo Components - TerraTex NO4.5 (AOS US Standard Sieve 70) geotextile fabric or approved equal.

510.3 Construction Methods

(1) General

Prior to commencing this Work, all erosion control and tree protection measures required shall be in place and all utilities located and protected as set forth in "General Conditions". Clearing the site shall conform to Item No. 102S, "Clearing and Grubbing". Maintenance of environmental quality protection shall comply with all requirements of "General Conditions" and Item No. 601S, "Salvaging and Placing Topsoil".

The Contractor shall Work such that a reasonable minimum of disturbance to existing utilities will result. Particular care shall be exercised to avoid the cutting or breakage of all existing utilities. If at any time the Contractor's operations damage the utilities in place, the Contractor shall immediately notify the owner of the utility to make the necessary repairs. When active wastewater sewer lines are cut in the trenching operations, temporary flumes shall be provided across the trench while open and the lines shall be restored when the backfilling has progressed to the original bedding lines of the sewer so cut.

The Contractor shall inform utility owners sufficiently in advance of the Contractor's operations to enable such utility owners to reroute, provide temporary detours or to make other adjustments to utility lines in order that the Contractor may Work with a minimum of delay and expense. The Contractor shall cooperate with all utility owners concerned in effecting any utility adjustments necessary and shall not hold the City liable for any expense due to delay or additional Work because of conflicts arising from existing utilities.

The Contractor shall do all trenching in accordance with the provisions and the directions of the E/A as to the amount of trench left unfilled at any time. All excavation and backfilling shall be accomplished as indicated and in compliance with State Statutes.

Where excavation for a pipe line is required in an existing City street, an excavation permit is required and control of traffic shall be as indicated in accordance with the Texas Manual on Uniform Traffic Control Devices.

Wherever existing utility branch connections, sewers, drains, conduits, ducts, pipes or structures present obstructions to the grade and alignment of the pipe, they shall be permanently supported, removed, relocated or reconstructed by the Contractor through cooperation with the owner of the utility, structure or obstruction involved. In those instances where their relocation or reconstruction is impractical, a deviation from line and grade will be ordered by the E/A and the change shall be made in the manner directed.

Adequate temporary support, protection and maintenance of all underground and surface utility structures, drains, sewers and other obstructions encountered in the progress of the Work shall be furnished by, and at the expense of, the Contractor and as approved by the E/A.

Where traffic must cross open trenches, the Contractor shall provide suitable bridges in conformance with Standard 804S-4. Adequate provisions shall be made for the flow of sewers; drains and watercourses encountered during construction and any structures, which may have been disturbed, shall be satisfactorily restored upon completion of Work.

When rainfall or runoff is occurring or is forecast by the U.S. Weather Service, the Contractor shall not perform or attempt any excavation or other earth moving Work in or near the flood plain of any stream or watercourse or on slopes subject to erosion or runoff, unless given specific approval by the E/A. When such conditions delay the Work, an extension of time for working day contracts will be allowed in accordance with "General Conditions".

(2) Water Line/New Wastewater Line Separation

Separation between water, reclaimed water, and wastewater lines shall be provided as shown in the Drawings.

Crossings of water, reclaimed water, and wastewater lines shall conform to details in the Drawings.

Wastewater manholes within 9 feet of water and reclaimed water lines shall be made watertight according to details in the Drawings.

(3) Utility and Storm Sewer Crossings

When the Contractor installs a pipe that crosses under a utility or storm sewer structure and the top of the pipe is within 18 inches of the bottom of the structure, the pipe shall be backfilled as shown in the Drawings. When the Contractor installs a pipe that crosses under a utility or storm sewer structure that is not shown in the Drawings, the pipe shall be backfilled as directed by the Engineer. Payment for backfilling pipe at utility or storm sewer structures not shown in the Drawings shall be by Change Order.

(4) Trench Excavation

Excavation in a paved street shall be preceded by saw cutting completely through any asphaltic cement concrete or Portland cement concrete surface, base, or subbase to the underlying subgrade. This requirement shall not apply to excavations made with trenching machines that use a rotating continuous belt or chain for cutting and removing of material.

Underground piped utilities shall be constructed in an open cut in accordance with Federal regulations, applicable State Statutes conforming to Item No. 509S, "Excavation Safety Systems" and with a trench width and depth described below. When pipe is to be constructed in fill above the natural ground, Contractor shall construct embankment to an elevation not less than one foot above the top of the pipe, after which trench is excavated. Required vertical sides shall be sheeted and braced as indicated to maintain the sides of the required vertical excavation throughout the construction period. Adequacy of the design of sheeting and bracing shall be the responsibility of the Contractor's design professional. The Contractor shall be responsible for installation as indicated. After the pipe has been laid and the backfill placed and compacted to 12 inches above the top of the pipe, any sheeting, shoring and

bracing required may be removed with special care to ensure that the pipe is not disturbed. As each piece of sheeting is removed, the space left by its removal must be thoroughly filled and compacted with suitable material and provisions made to prevent the sides of the trench from caving until the backfill has been completed. Any sheeting left in place will not be paid for and shall be included in the unit price bid for pipe.

(5) Trench Width

Trenches for water, reclaimed, and wastewater lines shall have a clear width on each side beyond the outside surfaces of the pipe bell or coupling of not less than 6 inches nor more than 12 inches.

Trenches for Storm Sewers up to 42 inches shall have a width of 1 foot on each side beyond the outside surfaces of the pipe. Pipes more than 42 inches shall have a trench width not to exceed 18 inches on each side beyond the outside surfaces of the pipe.

If the trench width within the pipe zone exceeds this maximum, the entire pipe zone shall be refilled with approved backfill material, thoroughly compacted to a minimum of 95 percent of maximum density as determined by TxDOT Test Method Tex-114-E and then re-excavated to the proper grade and dimensions. Excavation along curves and bends shall be so oriented that the trench and pipe are approximately centered on the centerline of the curve, using short lengths of pipe and/or bend fittings if necessary.

For all utilities to be constructed in fill above natural ground, the embankment shall first be constructed to an elevation not less than 1 foot above the top of the utility after which excavation for the utility shall be made.

(6) Trench Depth and Depth of Cover

All pipe and in-line appurtenances shall be laid to the grades indicated. The depth of cover shall be measured from the established finish grade, natural ground surface, subgrade for staged construction, street or other permanent surface to the top or uppermost projection of the pipe.

(a) Where not otherwise indicated, all potable/reclaimed water piping shall be laid to the following minimum depths:

1. Potable/reclaimed water piping installed in undisturbed ground in easements of undeveloped areas, which are not within existing or planned streets, roads or other traffic areas shall be laid with at least 36 inches of cover.

2. Potable/reclaimed water piping installed in existing streets, roads or other traffic areas shall be laid with at least 48 inches of cover below finish grade.

3. Unless approved by the E/A, installation of potable/reclaimed water piping in proposed new streets will not be permitted until paving and drainage plans have been approved and the roadway traffic areas excavated to the specified or standard paving subgrade, with all parkways and sidewalk areas graded according to any applicable provisions of the drainage plans or sloped upward from the curb line to the right-of-way line at a minimum slope of ¼ inch per foot. Piping and appurtenances installed in such proposed streets shall be laid with at least 36 inches of cover below the actual subgrade.

(b) Where not otherwise indicated, all wastewater piping shall be laid to the following minimum depths:

1. Wastewater piping installed in natural ground in easements or other undeveloped areas, which are not within existing or planned streets, roads or other traffic areas shall be laid with at least 42 inches of cover.

2. Wastewater piping installed in proposed streets, existing streets, roads or other traffic areas shall be laid with at least 66 inches of cover.

(7) Classification of Excavation

Excavation will not be considered or paid for as a separate item of Work, so excavated material will not be classified as to type or measured as to quantity. Full payment for all excavation required for the construction shall be included in the various unit or lump sum Contract prices for the various items of Work installed, complete in place. No extra compensation, special treatment or other consideration will be allowed due to rock, pavement, caving, sheeting and bracing, falling or rising water, working under and in the proximity of trees or any other handicaps to excavation.

(8) Dewatering Excavation

Underground piped utilities shall not be constructed or the pipe laid in the presence of water. All water shall be removed from the excavation prior to the pipe placing operation to ensure a dry firm granular bed on which to place the underground piped utilities and shall be maintained in such unwatered condition until all concrete and mortar is set. Removal of water may be accomplished by bailing, pumping or by a well-point installation as conditions warrant.

In the event that the excavation cannot be dewatered to the point where the pipe bedding is free of mud, a seal shall be used in the bottom of the excavation. Such seal shall consist of Class B concrete, conforming to Item No. 403, "Concrete for Structures", with a minimum depth of 3 inches.

(9) Trench Conditions

Before attempting to lay pipe, all water, slush, debris, loose material, etc., encountered in the trench must be pumped or bailed out and the trench must be kept clean and dry while the pipe is laid and backfilled. Where needed, sump pits shall be dug adjoining the trench and pumped as necessary to keep the excavation dewatered.

Backfilling shall closely follow pipe laying so that no pipe is left exposed and unattended after initial assembly. All open ends, outlets or other openings in the pipe shall be protected from damage and shall be properly plugged and blocked watertight to prevent the entrance of trench water, dirt, etc. The interior of the pipeline shall at all times be kept clean, dry and unobstructed.

Where the soil encountered at established footing grade is a quicksand, saturated or unstable material, the following procedure shall be used unless other methods are indicated:

All unstable soils shall be removed to a depth of a minimum 2 feet below bottom of piped utility or as required to stabilize the trench foundation. Such excavation shall be carried out for the entire trench width.

All unstable soil so removed shall be replaced with a concrete seal, foundation rock or coarse aggregate materials placed across the entire trench width in uniform layers not to exceed 6 inches, loose measure and compacted by mechanical tamping or other means which shall provide a stable foundation for the utility.

Forms, sheathing and bracing, pumping, additional excavation and backfill required in unstable trench conditions shall be included in the unit price bid for pipe.

(10) Blasting

All blasting shall conform to the provisions of the "General Conditions" and/or "Public Safety and Convenience".

(11) Removing Old Structures

When out of service masonry structures or foundations are encountered in the excavation, such obstructions shall be removed for the full width of the trench and to a depth of 1 foot below the bottom of the trench. When abandoned inlets or manholes are encountered and no plan provision is made for adjustment or connection to the new sewers, such manholes and inlets within the construction limits shall be removed completely to a depth 1 foot below the bottom of the trench. In each instance, the bottom of the trench shall be restored to grade by backfilling and compacting by the methods provided above. Where the trench cuts through storm or wastewater sewers which are known to be abandoned, these sewers shall be cut flush with the sides of the trench and blocked with a concrete plug in a manner satisfactory to the E/A. When old structures are encountered, which are not visible from the existing surface and are still in service, they shall be protected and adjusted as required to the finished grade.

(12) Lines and Grades

Grades, lines and levels shall conform to the General Conditions and/or "Grades, Lines and Levels". Any damage to the above by the Contractor shall be re-established at the Contractor's expense. The Contractor shall furnish copies of all field notes and "cut sheets" to the City.

The location of the lines and grades indicated may be changed only by direction of the E/A. It is understood that the Contractor will be paid for Work actually performed on the basis of the unit Contract prices and that the Contractor shall make no claim for damages or loss of anticipated profits due to the change of location or grade.

All necessary electronic devices for controlling the Work shall be furnished by, and at the expense of, the Contactor. The Contractor shall furnish good working condition suitable devices for use in achieving lines and grades and the necessary plummets and graduated poles.

The Contractor shall submit to the E/A at least 6 copies of any layout Drawings from the pipe manufacturer for review and approval. The Contractor shall submit the layout Drawings at least 30 days in advance of any actual construction of the project. The E/A will forward all comments of the review to the Contractor for revision. Revisions shall be made and forwarded to the E/A for his acceptance. Prior to commencement of the Project, reviewed layout Drawings will be sent to the Contractor marked for construction.

Should the Contractor's procedures not produce a finished pipe placed to grade and alignment, the pipe shall be removed and relayed and the Contractors procedures modified to the satisfaction of the E/A. No additional compensation shall be paid for the removal and relaying of pipe required above.

(13) Surplus Excavated Materials

Excess material or material which cannot be made suitable for use in embankments will be declared surplus by the E/A and shall become the property of the Contractor to dispose of off site at a permitted fill site, without liability to the City or any individual. Such surplus material shall be removed from the Work site promptly following the completion of the portion of the utility involved.

(14) Pipe Bedding Envelope

Pipe shall be installed in a continuous bedding envelope of the type shown on the drawings or as described herein. The envelope shall extend the full trench width, to a depth of at least 6 inches (150 mm) below the pipe and to a depth of the springline of rigid concrete pipe or 1 inch above the top of pipe for flexible corrugated metal pipe of storm water pipe and at least 12 inches (300 mm) above water, reclaimed, and wastewater pipe.

(a) Standard Bedding Materials

USE/PIPE MATERIAL	Cement	Natural	Pea	PIPE BEDDING STONE

	Stabilized Backfill	or Mf'd Sand	Gravel	Uncrushed Gravel	Crushed Gravel	Crushed Stone	Stone Screenings
WATER and RECLAIMED WATER							
Welded Steel	X					X	
Service Tubing ¾" to 2½"		X	X				X
WATER and RECLAIMED WATER (Ductile Iron)							
Up to 15 Inch ID		X	X	X			X
Larger Than 15 Inch ID			X	X			
WATER and RECLAIMED WATER (PVC only) and WASTEWATER							
Up to 15 Inch ID		X	X	X	X	X	X
Larger Than 15 Inch ID			X	X	X	X	
STORMWATER							
Concrete		X	X	X	X	X	X
Metal		X	X	X			X

(b) General requirements and limitations governing bedding selection.

(1) Crushed gravel or crushed stone shall not be used with polyethylene tubing or polyethylene film wrap.

(2) Uncrushed gravel may be used with polyethylene film wrap in trenches up to 6 feet deep and in deeper trenches where ample trench width, a tremmie, or conditions will allow controlled placement of the gravel without damaging the polyethylene wrap.

(3) Bedding shall be placed in lifts not exceeding 8 inches loose thickness and compacted thoroughly to provide uniform support for the pipe barrel and to fill all voids around the pipe.

(4) Pea Gravel or bedding stone shall be used in blasted trenches.

(c) Requirements to prevent particle migration.

Bedding material shall be compatible with the materials in the trench bottom, walls and backfill so that particle migration from, into or through the bedding is minimized. The E/A may require one or more of the following measures to minimize particle migration: use of impervious cut-off collars; selected bedding materials, such as pea gravel or bedding stone mixed with sand; filter fabric envelopment of the bedding; cement stabilized backfill; or other approved materials or methods. Measures to minimize particle migration will be shown on the Drawings or designated by the E/A, and, unless provisions for payment are provided in the contract documents, the cost of these measures shall be agreed by change order. The following limitations shall apply.

(1) Sand, alone, shall not be used in watercourses, in trenches where groundwater is present, or in trenches with grades greater than 5 percent.

(2) Pea gravel or bedding stone, alone, shall not be used in the street right-of-way within 5 feet of subgrade elevation in trenches that are 3 feet or wider.

(3) Each gravel or bedding stone, alone, shall not be used where the trench bottom, sides, or backfill is composed of non-cementitious, silty or sandy soils having plasticity indices less than 20, as determined by the E/A.

(4) Sand, alone, shall not be used for installation of concrete storm water pipe unless the bedding envelope is wrapped with a geotextile membrane and the joints of the stormdrain

conduit are wrapped to prevent the migration of fines into the bedding envelope and into the stormdrain conduit.

(5) For concrete storm water pipe, if pea gravel, uncrushed gravel, crushed gravel, crushed stone, or combination thereof is used for pipe bedding material, a geotextile filter fabric shall be placed around the perimeter of the joint.

(15) Laying Pipe

No pipe shall be installed in the trench until excavation has been completed, the bottom of the trench graded and the trench completed as indicated.

Laying of corrugated metal pipes on the prepared foundation shall be started at the outlet end with the separate sections firmly joined together, with outside laps of circumferential joints pointing upstream and with longitudinal laps on the sides. Any metal in joints, which are not protected by galvanizing, shall be coated with suitable asphaltum paint. Proper facilities shall be provided for hoisting and lowering the sections of pipe into the trench without damaging the pipe or disturbing the prepared foundation and the sides of the trench. Any pipe which is not in alignment or which shows any undue settlement after laying or damage, shall be taken up and re-laid without extra compensation.

Multiple installations of corrugated pipe or arches shall be laid with the centerlines of individual barrels parallel. When not otherwise indicated, clear distances of 2 feet between outer surfaces of adjacent pipes shall be maintained.

No debris shall remain in the drainways or drainage structures.

All recommendations of the manufacturer shall be carefully observed during handling and installation of each material. Unless otherwise indicated, all materials shall be delivered to the project by the manufacturer or agent and unloaded as directed by the Contractor. Each piece shall be placed facing the proper direction near to where it will be installed.

The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter at all times and stored in a manner that will protect them from damage. Stockpiled materials shall be stacked so as to minimize entrance of foreign matter.

The interior of all pipeline components shall be clean, dry and unobstructed when installed.

Piping materials shall not be skidded or rolled against other pipe, etc. and under no circumstances shall pipe, fittings or other accessories be dropped or jolted.

During handling and placement, materials shall be carefully observed and inspected and any damaged, defective or unsound materials shall be marked, rejected and removed from the job site. Minor damage shall be marked and repaired in a manner satisfactory to the E/A. Joints, which have been placed, but not joined, backfilled, etc., shall be protected in a manner satisfactory to the E/A.

(16) Assembling of Pipe

Angular spacing of all joints shall meet the manufacturer's recommendations for the pipe and accessories being used. Side outlets shall be rotated so that the operating stems of valves shall be vertical when the valves are installed. Pressure pipe shall be laid with bell ends facing the direction of pipe installation. Pipe end bells shall be placed upgrade for all wastewater lines.

Orientation marks, when applicable, shall be in their proper position before pipe is seated.

Before joining any pipe, all foreign matter, lumps, blisters, excess coal tar coating, oil or grease shall be removed from the ends of each pipe and the pipe ends shall then be wire brushed and wiped clean and dry. Pipe ends shall be kept clean until joints are made.

Every precaution shall be taken to prevent foreign material from entering the pipe during installation. No debris, tools, clothing or other materials shall be placed in the pipe.

(17) Joints

(a) Mortar (Storm Drain joints only)

Pipe ends shall be clean, free of asphalt or other contaminants, which will inhibit the bond of the mortar to the pipe. The pipe ends shall be moistened immediately prior to placing the mortar in the joint.

(b) Cold Applied Preformed Plastic Gaskets (Storm Drain joints only)

The pipe ends shall be clean and the joint material applied to the dry pipe. In cold weather, the joint material shall be heated to facilitate the seal of the joint.

(c) O-Ring and Push-on Joints

Just before making a joint the ends of the pipe shall be clean, dry, free of any foreign matter, lump blisters, excessive coal tar coating and grease or oil and shall be wire brushed. The gasket and the inside surface of the bell shall be lubricated with a light film of soft vegetable soap compound (Flax Soap) to facilitate telescoping the joints. The rubber gasket if not factory installed shall be stretched uniformly as it is placed in the spigot groove to ensure a uniform volume of rubber around the circumference of the groove. The spigot shall be centered in the bell and the pipe pushed home uniformly to avoid twisting or otherwise displacing or damaging the rubber gasket. Bedding material shall be placed and tamped against pipe to secure the joint. Care should be taken to prevent dirt or foreign matter from entering the joint space.

Joint Gasket Inspection: After each pipe section is joined, inspect joint gasket to ensure that no displacement of gasket has occurred by use of a feeler gauge approximately 1/2 inch wide and 0.015-inch thick, or by other gasket inspection procedures approved or recommended by pipe manufacturer that ensures a watertight installation prior to backfilling. If gasket displacement has occurred, remove pipe section and remake joint as for new pipe. Remove old gasket and replace with new gasket before remaking joint.

(d) Bolted Joints

All flanged, mechanical or other bolted joints shall be joined with nuts and bolts and be coated as indicated above in Iron Pipe.

(e) Storm Drain Joints

Storm drain joints sealed with preformed flexible joint sealants shall be provided and installed in compliance with ASTM C990. Storm drain joints sealed with rubber gaskets shall comply with ASTM C443 Install joint sealants in accordance with the pipe and joint sealant manufacturers' recommendations. Place the joint sealer so that no dirt or other deleterious materials come in contact with the joint sealing material. Pull or push home the pipe with enough force to properly seal the joint with the final joint opening (gap) on the inside of the installed pipe being less than or equal to the pipe manufacturer's recommended dimensions. Protrusion of joint material greater than ⅛" into the interior of the pipe will not be accepted. Excess joint material will be removed to within ⅛''of pipe surface. Observe joint sealant manufacturer's recommendations for installation temperature of the joint sealant. Apply joint sealant to pipe joint immediately before placing pipe in trench, and then connect pipe to previously laid pipe.

If inspection (video or other means) reveal C-990 joints that show signs of backfill infiltration, or where joints or conduits exhibit excessive joint gap or are otherwise defective, then the contractor has the following options:

1. Conduits less than 36-inches in any dimension: pour a concrete collar around the joint or wrap joint with a wrap meeting requirements of ASTM C-877 or approved equal.

2. Conduits greater than or equal to 36-inches in all dimensions: repair joints using joint repair techniques recommended by the manufacturer to achieve a completed system that meets all Contract requirements.

(18) Pressure Pipe Laying

(a) Grout for Concrete Steel Cylinder Pipe (CSC) and Welded Steel Pipe

Aggregate, cement, etc., shall be as indicated in "Mortar" herein. Potable water shall be used in the preparation of any cement, mortar, or grout lining.

Grout shall be poured into the recess between the bell and spigot on the outside of the pipe and contained by a joint wrapper ("diaper") recommended by the pipe manufacturer. The wrapper shall have a minimum width of 7 inches for 30 inch and smaller and 9 inches for larger pipe, secured to the pipe by "Band Iron" steel straps. The grout shall be poured in one continuous operation in such manner that after shrinkage and curing the joint recess shall be completely filled.

Mortar for the inside recess shall be of the consistency of plaster. The inside recess between the bell and spigot shall be filled with mortar after the pipe joint on either side of the recess has been backfilled and well tamped with no less than one pipe joint installed ahead of the pipe forming the recess. The mortar shall completely fill the recess and shall be trowelled and packed into place and finished off smooth with the inside of the pipe.

The Contractor shall inspect the joint after the mortar has set and make repairs of any pockets, cracks or other defects caused by shrinkage to the satisfaction of the E/A. The inside surface shall be cleared of any mortar droppings, cement, water, slurry, etc., before they have become set and shall be cleared of any other foreign matter. The inside surface of the pipe shall be left clean and smooth.

Pipe shall be handled at all times with wide non abrasive slings, belts or other equipment designed to prevent damage to the coating and all such equipment shall be kept in such repair that its continued use is not injurious to the coating. The use of tongs, bare pinch-bars, chain slings, rope slings without canvas covers, canvas or composition belt slings with protruding rivets, pipe hooks without proper padding or any other handling equipment, which the E/A deems to be injurious to the coating, shall not be permitted. The spacing of pipe supports required to handle the pipe shall be adequate to prevent cracking or damage to the cement mortar lining.

(19) Placing Pipe in Tunnels

Piping installed as a carrier pipe in a tunnel, encasement pipe, etc., shall have uniform alignment, grade, bearing and conform to the reviewed Shop Drawings. All necessary casing spacers, bedding material, grout cradle or paving, bracing, blocking, etc., as stipulated by the Contract or as may be required to provide and maintain the required pipe alignment and grade, shall be provided by the Contractor at no cost except as provided by the Bid Items. This shall include casing spacers acceptable to the Owner attached to the carrier pipe in accordance with the manufacturer's recommendations. The insertion pushing forces shall not exceed the pipe manufacturer's recommendation. Such carrier piping shall have flexible bolted or gasketed push-on joints or Concrete Steel Cylinder pipe installed as follows:

(a) 21 Inch Pipe and Smaller

Prior to placing the pipe in the tunnel, the inside joint recess at the bell shall be buttered with cement mortar.

After the joint is engaged, the excess mortar shall be smoothed by pulling a tight fitting swab through the joint. Cement mortar protection shall then be placed in the normal manner to the exterior of the joint and allowed to harden sufficiently to avoid dislodgment during installation. If time is of the essence, a quick setting compound may be used.

(b) 24 Inch Pipe and Larger

Each length of pipe shall be pushed into the tunnel as single units. A flexible mastic sealer shall be applied to the exterior of the joint prior to joint engagement. The surfaces receiving the mastic sealer shall be cleaned and primed in accordance with the manufacturer's recommendation. Sufficient quantities of the mastic sealer shall be applied to assure complete protection of all steel in the joint area. The interior of the joint shall be filled with cement mortar in the normal manner after the pipe is in its final position within the tunnel.

(20) Temporary Pipe Plugs, Caps, Bulkheads and Trench Caps

Temporary plugs, caps or plywood bulkheads shall be installed to close all openings of the pipe and fittings when pipeline construction is not in progress.

All temporary end plugs or caps shall be secured to the pipe as provided under Item No. 507, "Bulkheads".

Trench caps shall be reinforced Class D concrete as indicated.

(21) Corrosion Control

(a) Protective Covering

Unless otherwise indicated, all flanges, nuts, bolts, threaded outlets and all other iron or steel components buried and in contact with earth or backfill shall be wrapped with 8-mil (minimum) polyethylene film meeting ANSI/AWWA C-105 to provide a continuous wrap.

(22) Pipe Anchorage, Support and Protection

Pressure pipeline tees, plugs, caps and bends exceeding 22½ degrees; other bends as directed shall be securely anchored by suitable methods as defined in the construction documents. Unless otherwise indicated, on 24 inch or larger piping, all bends greater than 11 ¼ degrees shall be anchored as described herein.

Storm sewers on steep grades shall be lugged as indicated.

(a) Concrete Thrust Blocking

Concrete for use as reaction or thrust blocking shall be Class B conforming to Item No. 403, "Concrete for Structures".

Concrete blocking shall be placed between solid ground and the fitting to be anchored. The area of bearing on the pipe and on the ground shall be as indicated or directed by the E/A. The blocking shall, unless otherwise indicated, be so placed that the pipe, fittings and joints will be accessible for repair.

The trench shall be excavated at least 6 inches outside the outermost projections of the pipe or appurtenance and the trench walls shaped or undercut according to the detail Drawings or as required to provide adequate space and bearing area for the concrete.

The pipe and fittings shall be adequately weighted and laterally braced to prevent floating, shifting or straining of the pipeline while the concrete is being placed and taking initial set. The Contractor shall be solely responsible for the sufficiency of such restraints.

(b) Metal Thrust Restraint

Fabricated thrust restraint systems such as those described below may be approved for use instead of concrete blocking. To obtain approval, the project Drawings must include sufficient drawings, notes, schedules, etc., to assure that the proposed restraints as installed will be adequate to prevent undesirable movement of the piping components. Such restraint systems may only be used where and as specifically detailed and scheduled on approved Project Drawings.

1. Thrust Harness

   A metal thrust harness of tie rods, pipe clamps or lugs, turnbuckles, etc., may be approved. All carbon steel components of such systems, including nuts and washers, shall be hot-dip galvanized; all other members shall be cast ductile iron. After installation, the entire assembly shall be wrapped with 8-mil polyethylene film, overlapped and taped in place with duct tape to form a continuous protective wrap.

2. Restrained Joints

   Piping or fitting systems utilizing integral mechanically restrained joints may be approved. All components of such systems shall be standard manufactured products fabricated from cast ductile iron, hot-dip galvanized steel, brass or other corrosion resistant materials and the entire assembly shall be protected with a continuous film wrap as described for 1. above. Manufacturers of pipe with restrained joints integral to the pipe shall be listed on SPL WW-27F. All pipe and fitting systems with restrained joints shall be identified by applying an adhesive-backed warning tape to the top of the pipe and for the full length of the pipe, regardless of the type of pipe. For plastic pipes the warning tape shall be applied directly to the top of the pipe. For metal pipes and fittings the warning tape shall be applied to the top of the polyethylene film wrap. The warning tape shall conform to 510.2(8)(b)5.

   Location, configuration and description of such products shall be specifically detailed on the Drawings. (Add-on attachments such as retainer glands, all-thread rods, etc., are not acceptable.)

(c) Concrete Encasement, Cradles, Caps and Seals

When trench foundation is excessively wet or unstable or installation of water or wastewater pipe will result in less than 30 inches of cover, Contractor shall notify E/A. E/A may require Contractor to install a concrete seal, cradle, cap, encasement or other appropriate action.

All concrete cap, etc., shall be continuous and begin and end within 6 inches of pipe joints. Concrete cap, cradle and encasement shall conform to COA Standard 510S-1, "Concrete Trench Cap". The pipe shall be well secured to prevent shifting or flotation while the concrete is being placed.

(d) Anchorage Bulkheads

Concrete bulkheads keyed into the undisturbed earth shall be placed as indicated to support and anchor the pipe and/or backfill against end thrust, slippage on slopes, etc. Concrete material and placement shall be Class A, Item No. 403, "Concrete for Structures".

(e) Trench Caps, Concrete Rip-Rap and Shaped Retards

Where called for by the Contract or as directed by the E/A, concrete trench caps, concrete rip-rap and/or shaped retards shall be placed as detailed by the Drawings as protection against erosion. Concrete material and placement shall be Class B, Item No. 403, "Concrete for Structures".

(23) Wastewater Connections

(a) Connections to Mains 12 Inches and Smaller

All branch connections of new main lines shall be made by use of manholes.

Service stubs shall be installed as indicated. Minimum grade shall be 1 percent downward to main and minimum cover shall be 4½ feet at the curb. Standard plugs shall be installed in the dead end before backfilling.

Where a service connection to a main 12 inches or smaller is indicated, a wye, tee or double wye shall be installed.

Where a service connection to a main 15 inches or larger is indicated, a field tap may be made with the pipes installed crown to crown. The tap should be made conforming to the pipe manufacturer's recommendations with the E/A's approval.

Where not otherwise indicated, (wastewater) service connections shall be installed so that the outlet is at an angle of not more than 45 degrees above horizontal at the main line.

(b) Connections to the Existing System

Unless otherwise specified by the E/A, all connections made to existing mains shall be made at manholes with the crown of the inlet pipe installed at the same elevation as the crown of the existing pipe. Service stubs installed on the existing system shall be installed by use of tapping saddles unless otherwise approved by the E/A. Extreme care shall be exercised to prevent material from depositing in the existing pipe as the taps are being made.

When connections to existing mains are made, a temporary plug approved by the E/A must be installed downstream in the manhole to prevent water and debris from entering the existing system before Final Completion. These plugs shall be removed after the castings are adjusted to finish grade or prior to Final Completion.

(c) Connecting Existing Services to New Mains

Where wastewater services currently exist and are being replaced from the main to the property line, those services shall be physically located at the property line prior to installing any new mains into which the services will be connected. Where wastewater services currently exist but are not being replaced to the property line, those services shall be physically located at the point of connection between the new and existing pipes prior to installing any new mains into which the services will be connected.

(24) Potable or Reclaimed Water System Connections

All necessary connections of new piping or accessories to the existing potable or reclaimed water system shall be made by, and at the expense of, the Contractor. To minimize any inconvenience from outages, the Contractor shall schedule all such connections in advance and such schedule must be approved by the E/A before beginning any Work. When cutting existing water mains, the contractor shall ensure the existing pipe shall not be cut within 3 feet of an existing pipe joint. If a pipe joint exists within 3 feet, then adjacent pipe joint shall be removed and new pipe and approved sleeve installed in its place.

(a) Shutoffs

The City will make all shutoffs on existing potable or reclaimed water mains. The Contractor shall be required to notify the Owner's Representative in writing a least twenty five (25) Calendar Days prior to the anticipated date for a wet-connection. The Owner's Representative is defined as the City Inspector. The Owner's Representative will notify any affected utility customers at least 48 hours prior to the shutoff. AW will make the shutoff after ensuring that all appropriate measures have been taken to protect the potable or reclaimed water system, customers and employees.

The City will operate all valves to fill existing mains. Where a newly constructed main has not been placed in service and has only one connection to the potable or reclaimed system, the Contractor may operate one valve to fill the main after approval has been obtained from AW. The operation of the valve is to be conducted under the immediate supervision of the Owner's Representative.

Water for the Work shall be metered and furnished by the Contractor in accordance with Section 01500 of the Standard Contract Documents.

(b) Wet Connections to Existing Potable or Reclaimed Water System

A wet connection is required when connecting a new main to an existing main by cutting in a new MJ ductile iron tee, fitting or gate valve.

The Contractor shall make all wet connections called for by the Contract or required to complete the Work. Two connections to an existing line performed during the same shutout, at the same time and at a distance less than 50 linear feet apart, will be considered one wet connection. Two connections to an existing line performed during the same shutout, at the same time and at a distance equal to, or greater than 50 linear feet will be considered two wet connections. A wet connection shall include draining and cutting into existing piping and connecting a new pipeline or other extension into the existing pressure piping, forming an addition to the potable or reclaimed water transmission and distribution network.

The Contract price for wet connections shall be full payment for all necessary shutoffs, excavation, removing plugs and fittings, pumping water to drain the lines, cutting in new fittings, blocking and anchoring piping, bedding and backfilling, placing the lines and service and all site cleanup.

No water containing detectable amounts of chlorine may be drained, released or discharged until specific planning and appropriate preparations to handle, dilute and dispose of such chlorinated water are approved in advance by the City and the disposal operations will be witnessed by an authorized representative from the City.

(c) Pressure Taps to Existing Potable or Reclaimed Water System

The Contractor shall make all pressure taps called for by the Contract Documents or required to complete the Work. A pressure tap shall consist of connecting new piping to the existing potable or reclaimed water system by drilling into the existing pipe while it is carrying water under normal pressure without taking the existing piping out of service.

Unless otherwise provided by the Contract, the Contractor shall, at the Contractor's expense, perform all necessary excavation, furnish and install the tapping sleeve, valve and accessories, provide the tapping machine, drill the tap and shall block, anchor and backfill the piping, valve and all accessories, place the new piping in service and perform all site cleanup. When the City makes the tap, City forces are not obligated or expected to perform any Work except to provide tapping machine and drill the actual hole. If City crews are to make the tap, fiscal arrangements must be made in advance at the Taps Office, Waller Creek Center, 625 East 10th Street.

If a private Contractor makes the tap, an AW Inspector must be present. "Size on size" taps will not be permitted, unless made by use of an approved full bodied mechanical joint tapping sleeve. Concrete blocking shall be placed behind and under all tap sleeves 24 hours prior to making the pressure tap.

Pressure taps shall be performed by AW approved Contractors and requires the use of approved SPL listed tapping sleeves.

(d) Service Connections

Service connection taps into PVC or AC pipe or into CI or DI pipe 12 inches or smaller shall be made using either a service clamp or saddle or a tapping sleeve as recommended by the pipe manufacturer and as approved by the E/A. Direct tapping of these pipes will not be permitted.

All potable or reclaimed water service connections shall be installed so that the outlet is at an angle of not more than 45 degrees above horizontal at the main line.

Precautions should be taken to ensure that the tapping saddle or sleeve is placed on the pipe straight to prevent any binding or deformation of the PVC pipe. The mounting chain or U-bolt strap must be tight.

Tapping shall be performed with a sharp shell type cutter so designed that it will smoothly penetrate heavy walled PVC DR14 and 200 psi AC and will retain and extract the coupon from the pipe.

(25) Backfilling

(a) General

Special emphasis is placed upon the need to obtain uniform density throughout the backfill material. The maximum lift of backfill shall be determined by the compaction equipment selected and in no case shall it exceed 18 inches, loose measurement.

No heavy equipment, which might damage pipe, will be allowed over the pipe until sufficient cover has been placed and compacted. All internal pipe bracing installed or recommended by the manufacturer shall be kept in place until the pipe bedding and trench backfill have been completed over the braced pipe section. Testing of the completed backfill in streets and under and around structures shall meet the specified density requirements. Initial testing shall not be at Contractor's expense and shall conform to the "General Conditions."

(b) General Corrugated Metal Pipe

After the corrugated metal pipe structure has been completely assembled on the proper line and grade and headwalls constructed where indicated; selected material free from rocks over 8 inches in size from excavation or borrow, as approved by the E/A, shall be placed along both sides of the completed structures equally, in uniform layers not exceeding 6 inches in depth (loose measurement), sprinkled if required and thoroughly compacted between adjacent structures and between the structures and the sides of the trench.

Backfill material shall be compacted to the same density requirements as indicated for the adjoining sections of embankment in accordance with the governing specifications thereof. Above the ¾ point of the structure, the fill shall be placed uniformly on each side of the pipe in layers not to exceed 12 inches, loose measure.

Prior to adding each new layer of loose backfill material, until a minimum of 12 inches of cover is obtained over the crown of the pipe, an inspection will be made of the inside periphery of the corrugated metal structure to determine if any floating, local or unequal deformation has occurred as a result of improper construction methods.

(c) Backfill Materials

The Engineer or designated representative may approve any of the following well graded materials as backfill:

1. Select trench material
2. Sand
3. Crushed rock cuttings

4. Rock cuttings
5. Foundation Rock
6. Blasted material with fines and rock
7. Cement stabilized material
8. Borrow

Within the 100-year flood plain, sand will not be permitted for backfilling. The Engineer or designated representative will approve the topsoil for areas to be seeded or sodded.

(d) Backfill in Street Right-of-Way

Placement of backfill under existing or future pavement structures and within 2 feet of any structures shall be compacted to the specified density using any method, type and size of equipment, which will produce the specified compaction without damaging the pipe or bedding. Placement of backfill greater than 2 feet beyond structures in right-of-way shall conform to (g) below.

The thickness of lifts, prior to compaction, shall depend upon the type of sprinkling and compacting equipment used and the test results thereby obtained. Prior to and in conjunction with the compaction operation, each lift shall be brought to the moisture content necessary to obtain the specified density and shall be placed in a uniform thickness to ensure uniform compaction over the entire lift. Testing for density shall be in accordance with Test Method Tex-114-E and Test Method Tex-115-E.

It is highly desirable that the backfill lifts be placed in a flat (or level) configuration; however when approved by the Engineer or designated representative, the backfill lifts may be placed at gradients (percent of vertical rise or fall to horizontal run) that do not exceed 30%.

The proposed gradient for each lift or series of lifts shall be established based on the capabilities of the equipment proposed to attain the required compaction.

Each lift of backfill must provide the density as specified herein. Swelling soils (soils with a minimum Liquid Limit of 50, more than 50% passing a #200 sieve and a plasticity index greater than 22) shall be sprinkled as required to provide not less than optimum moisture nor more than 2 percent over optimum moisture content and compacted to the extent necessary to provide not less than 95 percent nor more than 102 percent of the density as determined in accordance with Test Method Tex-114-E. Non-swelling soils shall be sprinkled as specified and compacted to the extent necessary to provide not less than 95 percent of the density as determined in accordance with Test Method Tex-114-E.

After each lift of backfill is complete, tests may be made by the Engineer or designated representative. If the material fails to meet the density indicated, the course shall be reworked as necessary to obtain the indicated compaction and the compaction method shall be altered on subsequent Work to obtain indicated density.

At any time, the Engineer or designated representative may order proof rolling to test the uniformity of compaction of the backfill lifts. All irregularities, depressions, weak or soft spots that develop shall be corrected immediately by the Contractor.

If the backfill, due to any reason, loses the specified stability, density or finish before the pavement structure is placed, it shall be recompacted and refinished at the sole expense of the Contractor. Excessive loss of moisture in the subgrade shall be prevented by sprinkling, sealing or covering with a subsequent backfill layer or granular material. Excessive loss of moisture shall be construed to exist when the subgrade soil moisture content is more than 4 percent below the

optimum of compaction ratio density. Backfill shall be placed from the top of the bedding material to the existing grade, base course, subgrade or as specified. The remainder of the street backfill shall either be Flexible Base, Concrete or Hot Mix Asphalt Concrete as specified on the drawings or replacement "in kind" to the surface of the materials originally removed for placement of the pipe.

(e) Backfill in County Street or State Highway Right-of-Way

All Work within the right-of-way shall meet the requirements of (d) above, as a minimum and shall meet the requirements of the permit issued by the County when their requirements are more stringent. Prior to the start of construction, the Contractor shall be responsible for contacting the appropriate TxDOT office or County Commissioner's Precinct Office and following the operating procedures in effect for utility cut permits and pavement repair under their jurisdiction. Approval for all completed Work in the State or County right-of-way shall be obtained from the appropriate Official prior to final payment by the Owner.

(f) Backfill in Railroad Right-of-Way

All Work within the railroad right-of-way shall meet the requirements of (d) above, as a minimum and shall meet the requirements of the permit issued by the Railroad Owner when their requirements are more stringent. Approval for all completed Work in the railroad right of way shall be obtained from the Railroad prior to Final Completion.

(g) Backfill in Easements

Where not otherwise indicated, Contractor may select whatever methods and procedures may be necessary to restore entire Work area to a safe, useful and geologically stable condition with a minimum density of 85 percent or a density superior to that prior to construction.

In and near flood plain of all streams and watercourses, under or adjacent to utilities, structures, etc. all backfill shall be compacted to a density of not less than 95 percent conforming to TxDOT Test Method Tex-114-E, unless otherwise directed by E/A.

All soil areas disturbed by construction shall be covered with top soil and seeded conforming to Item No. 604, "Seeding for Erosion Control". All turf, drainways and drainage structures shall be constructed or replaced to their original condition or better. No debris shall remain in the drainways or drainage structures.

(h) Temporary Trench Repair/Surfacing

If details of temporary trench repair/surfacing are not provided in the contract documents, the Contractor shall submit for approval of the E/A (1) a plan for temporary trench repair for areas that will be open to traffic but will be excavated later for full depth repair, and (2) a proposed method for covering trenches to maintain access to properties. The temporary surfacing shall afford a smooth riding surface and shall be maintained by the Contractor the entire time the temporary surface is in place.

(i) Permanent Trench Repair

The Contractor shall install permanent trench repairs conforming to details in the drawings.

(26) Quality Testing for Installed Pipe

(a) Wastewater Pipe Acceptance Testing

After wastewater pipe has been backfilled, the Contractor shall perform infiltration tests, exfiltration tests, or low pressure air tests as determined by the E/A. In addition, the Contractor shall perform deflection tests and shall assist OWNER'S personnel, as directed, in performing

pipeline settlement tests. The Contractor shall be responsible for making appropriate repairs to those elements that do not pass any of these tests.

(b) Exfiltration Test

Water for the Work shall be metered and furnished by the Contractor in accordance with Section 01500 of the Standard Contract Documents.

Exfiltration testing shall be performed by the Contractor when determined by the E/A to be the appropriate test method. Exfiltration testing shall conform to requirements of the Texas Commission on Environmental Quality given in the Texas Administrative Code Title 30 Part 1 Chapter 317 Rule §317.2.

(c) Infiltration Test

Infiltration testing shall be performed by the Contractor when determined by the E/A to be the appropriate test method. Infiltration testing shall conform to requirements of the Texas Commission on Environmental Quality given in the Texas Administrative Code Title 30 Part 1 Chapter 317 Rule §317.2.

(d) Pipeline Settlement Test

During the infiltration test or after the exfiltration test, the pipe will be TV inspected for possible settlement. When air testing has been used, water shall be flowed into the pipe to permit meaningful observations. Any pipe settlement which causes excessive ponding of water in the pipe shall be cause for rejection. Excessive ponding shall be defined as a golf ball (1⅝" dia.) submerged at any point along the line.

(e) Low Pressure Air Test of Gravity Flow Wastewater Lines

(1) General

Wastewater lines up to 33-inch diameter shall be air tested between manholes. Wastewater lines 36-inch in diameter and larger shall be either air tested between manholes or at pipe joints. Backfilling to grade shall be completed before the test and all laterals and stubs shall be capped or plugged by the Contractor so as not to allow air losses, which could cause an erroneous, test result. Manholes shall be plugged so they are isolated from the pipe and cannot be included in the test.

All plugs used to close the sewer for the air test shall be capable of resisting the internal pressures and must be securely braced. Place all air testing equipment above ground and allow no one to enter a manhole or trench where a plugged sewer is under pressure. Release all pressure before the plugs are removed. The testing equipment used must include a pressure relief device designed to relieve pressure in the sewer under test at 10 psi or less and must allow continuous monitoring of the test pressures in order to avoid excessive pressure. Use care to avoid the flooding of the air inlet by infiltrated ground water. (Inject the air at the upper plug if possible.) Use only qualified personnel to conduct the test.

(2) Ground Water

Since the presence of ground water will affect the test results, test holes shall be dug to the pipe zone at intervals of not more than 100 feet and the average height of ground water above the pipe (if any) shall be determined before starting the test.

(3) Test Procedure

The E/A may, at any time, require a calibration check of the instrumentation used. Use a pressure gauge having minimum divisions of 0.10 psi and an accuracy of 0.0625 psi. (One

ounce per square inch.) All air used shall pass through a single control panel. Clean the sewer to be tested and remove all debris where indicated. Wet the sewer prior to testing. The average back pressure of any groundwater shall be determined (0.433 psi) for each foot of average water depth (if any) above the sewer.

Add air slowly to the section of sewer being tested until the internal air pressure is raised to 3.5 psig greater than the average back pressure of any ground water that may submerge the pipe. After the internal test pressure is reached, allow at least 2 minutes for the air temperature to stabilize, adding only the amount of air required to maintain pressure. After the temperature stabilization period, disconnect the air supply. Determine and record the time in seconds that is required for the internal air pressure to drop from 3.5 psig to 2.5 psig greater than the average backpressure of any ground water that may submerge the pipe.

For pipe less than 36-inch diameter, compare the time recorded with the time computed using the following equation:

$T = (0.0850 \times D \times K) \div Q$, where

T = time for pressure to drop 1.0 pounds per square inch gauge in seconds;

K = $0.000419 \times D \times L$, but not less than 1.0

D = nominal inside diameter, in inches, as marked on the pipe;

L = length of line of same pipe size in feet; and

Q = rate of loss, 0.0015 cubic feet per minute per square foot of internal surface area (ft3/min/ft sq) shall be used.

Because a K value of less than 1.0 shall not be used, there are minimum test times for each pipe diameter as shown in the following table:

Table For Low Pressure Air Testing of Pipe

Pipe Diameter (inches)	Minimum Time (seconds)	Minimum Time Applies to All Pipes Shorter than (feet)	Time for Longer Pipes (seconds)
8	454	298	1.520 × L
10 (See Note 1)	567	239	2.374 × L
12	680	199	3.419 × L
15	850	159	5.342 × L
18	1020	133	7.693 × L
21	1190	114	10.471 × L
24	1360	100	13.676 × L
30	1700	80	21.369 × L

Note 1. 10-inch diameter pipe to be used only by AW maintenance personnel.

Note 2. The test parameter for pipes larger than 30-inch diameter shall be shown on the construction plans.

Any drop in pressure, from 3.5 psig to 2.5 psig (adjusted for groundwater level), in a time less than that required by the above equation or table shall be cause for rejection. When the line tested includes more than one size pipe, the minimum time shall be that given for the largest size pipe included.

When joint testing, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch to 2.5 pounds per square inch gauge during a joint test, regardless of pipe size, shall be twenty (20) seconds. A drop in pressure from 3.5 psig to 2.5 psig (adjusted for groundwater level) in less than twenty seconds shall be cause for rejection.

Manholes must be tested separately and independently. All manholes must be hydrostatically tested with a maximum loss allowance of 0.025 gallon per foot diameter per foot of head per hour.

When lines are air tested, manholes are to be tested separately by exfiltration or vacuum method (see Standard Specification Item No. 506S, "Manholes").

(f) Deflection Test

Deflection tests shall be performed by the Contractor on all flexible and semi-rigid wastewater pipes. The tests shall be conducted after the final backfill has been in place at least 30 days. Testing for in-place deflection shall be with a pipe mandrel at 95% of the inside diameter of the pipe. A second test of flexible and semi-rigid wastewater pipes 18 inch size and larger, also with a pipe mandrel sized at 95% of the inside diameter of the pipe, shall be conducted by the Contractor 30 days before the warranty expires on the Contractor's Work.

Contractor shall submit proposed pipe mandrels to the E/A or the E/A's designated representative for concurrence prior to testing the line.

Test(s) must be performed without mechanical pulling devices and must be witnessed by the E/A or the E/A's designated representative.

Any deficiencies noted shall be corrected by the Contractor and the test(s) shall be redone.

(g) Inspection of Installed Storm Drain Conduits

(1) General

All storm drain conduits (pipe and box culvert) shall be inspected for conformance to the requirements of this specification. Smart Housing, low/moderate income housing, and projects that are 100-percent privately funded are exempt from the cost of the initial video inspection. All deficiencies revealed by inspection shall be corrected. Video re-inspection meeting the requirements of this specification shall be provided at the Contractor's expense to show that deficiencies have been corrected satisfactorily. Further, the contractor shall provide video in complete segments (manhole to manhole) versus specific deficiency locations.

Projects that are not exempt from the cost of the initial video inspection are also subject to the following constraints:

- All inspectors utilized by the Contractor for video inspection shall be NASSCO-PACP certified for a minimum of 3 years.
- The Contractor will be required to inspect, assess, and record the condition of the storm drain pipe using National Association of Sewer Service Companies (NASSCOs) Pipeline Assessment Certification Program (PACP) coding standards.

(2) Video Inspection of Installed Storm Drain Conduits

Contractor shall provide all labor, equipment, material and supplies and perform all operations required to conduct internal closed-circuit television and video recording of all storm drain conduits. Video recording of each storm drain conduit section shall be conducted after the trench has been backfilled and prior to placement of permanent pavement repairs or permanent pavement reconstruction. The video recording shall be

provided to the Owner for review. Contractor shall not place permanent pavement repairs or permanent pavement reconstruction over the storm drain conduit until Owner has reviewed the video and agrees that there are no defects in the storm drain conduit installation shown in the video submitted by the Contractor or shown in any video acquired by the Owner through other means. Placement of permanent pavement repair or permanent pavement reconstruction over the installed storm drain conduit before the Owner acknowledges no defects shall be at the Contractor's risk. Any defects revealed by the video inspection shall be corrected at the Contractor's expense and a new video submitted to the Owner for review prior to acceptance of the conduit.

All video work shall be conducted under the direct full-time supervision of a NASSCO-PACP certified operator.

The conduit inspection camera shall have the capability of panning plus/minus 275 degrees and rotating 360 degrees. The television camera shall be specifically designed and constructed for such use. The camera shall be operative in 100% humidity conditions. Camera shall have an accurate footage counter that displays on the monitor the exact distance of the camera (to the nearest tenth of a foot) from the centerline of the starting manhole or access point. Camera shall have height adjustment so that the camera lens is always centered within plus/minus 10% of the center axis of the conduit being videoed. Camera shall provide a minimum of 460 lines of horizontal resolution and 400 lines of vertical resolution. Camera shall be equipped with a remote iris to control the illumination range for an acceptable picture. Geometrical distortion of the image shall not exceed one percent (1%). The video image produced by each camera shall be calibrated using a Marconi Resolution Chart No. 1 or equivalent.

Lighting for the camera shall be sufficient to allow a clear picture of the entire periphery of the conduit without loss of contrast, flare out of picture or shadowing. A reflector in front of the camera may be required to enhance lighting in dark or large sized conduit. The video camera shall be capable of showing on the digital display the Owner's name, Project name, Contractor name, date, line size and material, conduit identification, and ongoing footage counter. The camera, television monitor, and other components of the video system shall be capable of producing a picture quality satisfactory to the satisfaction of the Owner. The recording of the internal condition of the storm drain conduit shall be clear, accurate, focused and in color. If the recording fails to meet these requirements, the, equipment shall be removed and replaced with equipment that is suitable. No payment will be made for an unsatisfactory recording.

If during video inspection, water is encountered inside the conduit, the conduit shall be dewatered by the Contractor. The storm drain section must be dry. Video recording conducted while the camera is floating is not acceptable unless approved by the Owner.

If during video inspection, debris is encountered that prohibits a proper inspection of the conduit, the Contractor shall remove the debris before proceeding.

All video shall be documented using a data logger and reporting system that are PACP compliant and which use codes as established by the National Association of Sewer Service Companies (NASSCO)s - Pipeline Assessment and Certification Program (PACP).

Computer printed location records shall be kept by the Contractor and shall clearly show the location and orientation of all points of significance such as joints, conduit connections, connections at manholes and inlets, and defects. Copy of all records shall be supplied to the Owner. Noted defects shall be documented as color digital files and color hard copy print-outs. Photo logs shall accompany each photo submitted.

The video recording shall supply a visual and audio record of the storm drain conduits that may be replayed. Video recordings shall include an audio track recorded by the video technician during the actual video work describing the parameters of the storm drain conduit being videoed (i.e. location, depth, diameter, pipe material), as well as describing connections, defects and unusual conditions observed during the video work. Video recording playback shall be at the same speed that it was recorded. Slow motion or stop-motion playback features may be supplied at the option of the Contractor. Once videoed, the recordings shall be labeled and become the property of the Owner. The Contractor shall have all video and necessary playback equipment readily accessible for review by the Owner while the project is under construction.

Post-installation video shall not be completed until all work is completed on a section of storm drain conduit. Post-installation video work shall be completed by the Contractor in the presence of the Owner. The post-installation video work shall be completed to confirm that the storm drain conduits are free of defects. Provide a color video showing the completed work. Prepare and submit video logs providing location of storm drain conduit along with location of any defects. Manhole and inlet work shall be complete prior to post-installation video work.

For post-installation video, exercise the full capabilities of the camera equipment to document the completion and conformance of the storm drain installation work with the Contract Documents. Provide a full 360-degree view of conduit, all joints, and all connections. The camera shall be moved through the storm drain conduit in either direction at a moderate rate, stopping and slowly panning when necessary to permit proper documentation of the conduit condition at each pipe connection, joint, and defect. In no case shall the camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the storm drain conditions shall be used to move the camera through the storm drain conduit. When manually operated winches are used to pull the camera through the conduit, telephones or other suitable means of communication shall be set up between the two access points of the conduit being videoed to insure good communication between members of the video crew.

Distance measurements shall be provided to an accuracy of one tenth of a foot.

Video shall be continuous for each storm drain conduit segment. Do not show a single segment on more than one recording, unless specifically allowed by the Owner.

Contractor shall submit to Owner the following:

A. National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) certification of operators who will be performing video work.

B. Recording of storm drain conduits (concrete storm water pipe or box culvert) shall be provided to Owner in the form of a Compact Disc (CD), Digital Video Disc (DVD), or uploaded to an online file storage location.

    a. The color recordings shall include a digital color key map in a format acceptable to the Owner with each segment of storm drain conduit labeled with the appropriate inspection ID on the map.

    b. The file folder for each segment of the storm drain conduit shall have a unique name based on the Owner's approved inspection naming convention and shall contain the following:

i. Video files

ii. Video inspection logs with information coded in accordance with the PACP

iii. Photo logs

iv. A report summarizing the results of the video inspection

v. A proposed method of repair for any defects discovered.

(3) Time commitments from City for projects that are exempt from the cost of the initial video inspection

Projects that are exempt from the cost of the initial video inspection are afforded the following time commitments from the City.

A. Initial inspection - contractor must inform the COA construction inspector assigned to the project in writing that all stormdrain infrastructure for the project has been completed according to the permit and is ready for inspection. The inspector will then notify the Watershed Protection Department (WPD) in writing that the all of the stormdrain infrastructure for the project has been completed and is ready for inspection. The WPD is allowed 15-days to complete inspection from written notification by the inspector. The outcome of this item does not impact the one-year warranty requirements.

B. Video re-inspection by the contractor for deficient installed stormdrain infrastructure. The contractor must submit the video inspection data as defined in this specification to the COA construction inspector assigned to the project along with a written letter of transmittal certified by a professional engineer stating that all identified stormdrain infrastructure installation deficiencies for the project have been corrected. The inspector will then notify the Watershed Protection Department (WPD) in writing and convey the video inspection data to the WPD. The WPD is allowed 15-days to complete review of the data from the date of delivery by the inspector.

(27) Pressure Pipe Hydrostatic Testing

After the pipe has been installed and backfilled and all service laterals, fire hydrants and other appurtenances installed and connected, a pressure test, followed by a leakage test, will be conducted by the City. The City will furnish the pump and gauges for the tests. The Contractor shall be present and shall furnish all necessary assistance for conducting the tests. The specified test pressures will be based on the elevation of the lowest point of the line or section under test. Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points.

All drain hydrant and fire hydrant leads, with the main 6-inch gate valve open, the hydrant valve seats closed and no nozzle caps removed, shall be included in the test.

(a) Pressure Test

The entire project or each valved section shall be tested, at a constant pressure of 200 psi for a sufficient period (approximately 10 minutes) to discover defective materials or substandard work. The Contractor assumes all risks associated with testing against valves. Repairs shall be made by the Contractor to correct any defective materials or substandard work. The Contractor shall pre-test new lines before requesting pressure tests by City Forces. The Contractor shall have new lines pressurized to a minimum of 100 psi, on the date of testing, prior to arrival of City Forces.

(b) Leakage Test

A leakage test will follow the pressure test and will be conducted on the entire project or each valved section. The Contractor assumes all risks associated with testing against valves. The leakage test shall be conducted at 150 psi for at least 2 hours. The test pressure shall not vary by more than ±5 psi for the duration of the test.

(1) Allowable Leakage

Leakage shall be defined as the quantity of water that must be supplied into any test section of pipe to maintain the specified leakage test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

No pipe installation will be accepted if leakage exceeds the amount given by the following formula:

Allowable leakage (gal/hr) = [L × D] ÷ 10,875

Where L = length of pipe tested, in feet
D= nominal pipe diameter, in inches, as marked on the pipe

(2) Location and Correction of Leakage

If such testing discloses leakage in excess of this specified allowable, the Contractor, at the Contractor's expense, shall locate and correct all defects in the pipeline until the leakage is within the indicated allowance. Leakage disclosed at more than one gasketed pipe joint in any tested section will be considered indicative of improper installation and joint gasket inspection procedures by the Contractor for the entire tested section. That entire section of pipe shall be relayed at the Contractor's expense, employing installation procedures approved by the pipe manufacturer.

All visible leakage in pipe shall also be corrected by Contractor at the Contractor's expense.

(28) Service Charges for Testing

Initial testing performed by City forces for the Contractor will be at the City's expense. Retesting, by City forces, of Contractor's work that fails initial testing will be at the Contractor's expense. The City's charge for retests will be a base fee plus an hourly rate published in the current AW Fee Schedule. On City-funded projects, the charges incurred by the City for retesting will be deducted from funds due the Contractor. On non-City-funded projects, the charges incurred by the City for retesting will be billed to the Contractor. The City will withhold acceptance of the Contractor's work until the Contractor has paid the City for the retesting costs.

(29) Disinfection of Potable Water Lines

Prior to performing any disinfection of potable water lines, the Contractor shall submit a Disinfection Plan (Plan) and obtain approval in accordance with COA specification 01300, Submittals. The Plan shall comply with AWWA C651 (Disinfecting Water Mains) and AWWA C655 (Field Dechlorination), latest editions, and shall be developed using one of the following templates, unless otherwise approved by the Engineer and/or AW: Disinfection Plan for Tablet/Granule Method, or Disinfection Plan for Continuous-Feed Method. Templates for these two methods are located at http://www.austintexas.gov/department/construction-standards . The Contractor shall decide which disinfection method to use for a given project. All High Density Polyethylene (HDPE) pipe shall only be disinfected by the continuous feed method. Tablet/Granule Method is not allowed. The liquid disinfection chemical solution should be limited to less than 12% active chlorine. The time-duration of the disinfection should not exceed 24 hours. The Slug Method and Spray Method are also acceptable if better suited for disinfection. The initial plan shall be submitted for review a minimum of 60 calendar days prior to when the water main is scheduled to be placed into service, or at the preconstruction

conference if the project requires that the waterline be placed in service in less than 60 days, as indicated in the Contractor's Construction Schedule. If any appurtenances are required for injection, sampling, or flushing purposes that are not shown in the original plan/profile sheets, then the Contractor shall include the appurtenances in the project Record Drawings. The Contractor shall disinfect potable water lines only in accordance with an approved Plan.

(a) Preventing Contamination

The Contractor shall protect all piping materials from contamination during storage, handling and installation. Prior to disinfection, the pipeline interior shall be clean, dry and unobstructed. All openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work.

(b) Cleaning

Prior to disinfection the Contractor shall clean the pipeline to remove foreign matter. For pipelines 16” in diameter or smaller, cleaning shall consist of flushing the pipeline. For pipelines greater than 16” in diameter, cleaning shall be performed by operating hydrants and blow-offs located at low points in the pipeline, or by mechanical means (sweeping or pigging. Water for the Work shall be metered and furnished by the Contractor in accordance with Section 01500 of the Standard Contract Documents.

(c) Procedure and Dosage

For pipelines 16" or smaller in diameter, the Contractor may use either the AWWA C-651 "Tablet/Granular Method" or the "Continuous Feed Method" for disinfecting the pipeline. The Contractor, at its expense, will supply the test gauges and the Sodium Hypochlorite conforming to ANSI/AWWA B300, which contains approximately 5 percent to fifteen percent available chlorine, and will submit for approval a written plan for the disinfection process. Calcium Hypochlorite conforming to ANSI/AWWA B300, which contains approximately 65 percent available chlorine by weight, may be used in granular form or in 5 g tablets for 16” diameter or smaller lines, if it is included as part of the written plan of disinfection that is approved by the COA. The Contractor, at its expense, shall provide all other equipment, supplies and the necessary labor to perform the disinfection under the general supervision of the City.

One connection to the existing system will be allowed with a valve arranged to prevent the strong disinfecting dosage from flowing back into the existing water supply piping. The valve shall be kept closed and locked in a valve box with the lid painted red. No other connection shall be made until the disinfection of the new line is complete and the water samples have met the established criteria. The valve shall remain closed at all times except when filling or flushing the line and must be staffed during these operations. As an option, backflow prevention in the form of a reduced pressure backflow assembly may be provided if the valve is left unattended. The new pipeline shall be filled completely with disinfecting solution by feeding the concentrated chlorine and approved water from the existing system uniformly into the new piping in such proportions that every part of the line has a minimum concentration of 25 mg/liter available chlorine.

The disinfecting solution shall be retained in the piping for at least 16 hours and all valves, hydrants, services, stubs, etc. shall be operated so as to disinfect all their parts. After this retention period, the water shall contain no less than 10 mg/liter chlorine throughout the treated section of the pipeline.

For pipelines larger than 16” in diameter, the Contractor may use the AWWA C-651 "Slug Method" for disinfecting the pipeline. Chlorine shall be fed at a constant rate and at a sufficient concentration at one end of the pipeline to develop a slug of chlorinated water having not less than 100 mg/liter of free chlorine. The Contractor shall move the slug through the main so that

all interior surfaces are exposed to the slug for at least three (3) hours. The chlorine concentration in the slug shall be measured as it moves through the pipeline. If the chlorine concentration drops below 50 mg/liter, the Contractor shall stop the slug and feed additional chlorine to the head of the slug to restore the chlorine concentration to at least 100 mg/liter before proceeding. As the slug flows past fittings and valves, related valves and hydrants shall be operated so as to disinfect appurtenances and pipe branches.

Unless otherwise indicated, all quantities specified herein refer to measurements required by the testing procedures included in the current edition of AWWA C-651. The chlorine concentration at each step in the disinfection procedure shall be verified by chlorine residual determinations.

(d) Final Flushing

The heavily chlorinated water shall then be carefully flushed from the potable water line by a dechlorination process until the chlorine concentration is no higher than the residual generally prevailing in the existing distribution system. This is necessary to ensure that there is no injury or damage to the public, the water system or the environment. The plans and preparations of the Contractor must be approved by the City before flushing of the line may begin. The Contractor will supply the Dechlorination chemical conforming to ANSI/AWWA C655. Additionally the flushing must be witnessed by an authorized representative of the City.

Approval for discharge of the diluted chlorine water or heavily chlorinated water into the wastewater system must be obtained from AW. The line flushing operations shall be regulated by the Contractor so as not to overload the wastewater system or cause damage to the odor feed systems at the lift stations. The City shall designate its own representative to oversee the work.

Daily notice of line discharging must be reported to the AW Dispatch office.

(e) Bacteriological Testing

After disinfection and final flushing, samples shall be collected per one of the two options. Option A: Before approving a main for release, take an initial set of samples and then resample again after a minimum of 16 hours. Both sets of samples must pass for the main to be approved for release. Option B: Before approving a main for release, let it sit for a minimum of 16 hours without any water use. Then collect two sets of samples a minimum of 15 minutes apart while the sampling taps are left running. Both sets of samples must pass for the main to be approved for release. The two (2) sets of water samples from the line will be tested for bacteriological quality by the City and must be found free of coliform organisms before the pipeline may be placed in service. Each set shall consist of one (1) sample that is drawn from the end of the main, at least one from each branch greater than one pipe length, and additional samples that are collected at intervals of not more than 1,200 feet along the pipeline. All stubs shall be tested before connections are made to existing systems.

The Contractor, at its expense, shall install sufficient sampling taps at proper locations along the pipeline. Each sampling tap shall consist of a standard corporation cock installed in the line and extended with a copper tubing gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained for future use.

Samples for bacteriological analysis will only be collected from suitable sampling taps in sterile bottles treated with sodium thiosulfate. Samples shall not be drawn from hoses or unregulated sources. The City, at its expense, will furnish the sterile sample bottles and may, at its discretion, collect the test samples with City personnel.

If the initial disinfection fails to produce acceptable sample test results, the disinfection procedure shall be repeated at the Contractor's expense. Before the piping may be placed in service, two (2) consecutive sets of acceptable test results must be obtained.

An acceptable test sample is one in which: (1) the chlorine level is similar to the level of the existing distribution system; (2) there is no free chlorine and (3) total coliform organisms are absent. An invalid sample is one, which has excessive free chlorine, silt or non-coliform growth as defined in the current issue of the AWWA C-651. If unacceptable sample results are obtained for any pipe, the Contractor may, with the concurrence of the Inspector, for one time only flush the lines and then collect a second series of test samples for testing by the City. After this flushing sequence is completed, any pipe with one or more failed samples must be disinfected again in accordance with the approved disinfection procedure followed by appropriate sampling and testing of the water.

The COA Water Quality Laboratory will notify the assigned COA Inspector in writing of all test results. The Inspector will subsequently notify the Contractor of all test results. The Water Quality Laboratory will not release test results directly to the Contractor.

(30) Cleanup and Restoration

It shall be the Contractor's responsibility to keep the construction site neat, clean and orderly at all times. Cleanup shall be vigorous and continuous to minimize traffic hazards or obstructions along the streets and to driveways. Trenching, backfill, pavement repair (as necessary), and cleanup shall be coordinated as directed by the City. The E/A will regulate the amount of open ditch and may halt additional trenching if cleanup is not adequate to allow for orderly traffic flow and access.

Materials at the site shall be stored in a neat and orderly manner so as not to obstruct pedestrian or vehicular traffic. All damaged material shall be removed from the construction site immediately and disposed of in a proper manner. All surplus excavated materials shall become the property of the Contractor for disposal at the Contractor's expense. After trenching, the Contractor shall immediately remove all excavated materials unsuitable for or in excess of, backfill requirements. Immediately following the pipe laying Work as it progresses, the Contractor shall backfill, grade and compact all excavations as provided elsewhere. The backfill placed at that time shall meet all compaction test requirements. The Contractor shall immediately clean up and remove all unused soil, waste and debris and restore all surfaces and improvements to a condition equal or superior to that before construction began and to an appearance which complements the surroundings. The Contractor shall grade and dress the top 6 inches of earth surfaces with soil or other material similar and equal to the surrounding, fill and smooth any visible tracks or ruts, replace and re-establish all damaged or disturbed turf or other vegetation and otherwise make every effort to encourage the return of the entire surface and all improvements to a pleasant appearance and useful condition appropriate and complementary to the surroundings and equal or similar to that before construction began.

Placement of the final lift of permanent pavement, if a pavement is required, shall begin immediately after all testing of each segment of piping is satisfactorily completed.

(31) Valve Turn Walk-though

As part of the acceptance of Water or Reclaimed Water pressure pipe, an AW Valve Walk-through will be performed after an initial inspection by the Owner's Representative to identify any deficient items. If deficient items are present during the AW Valve Walk-Through and the project fails acceptance, a re-inspection fee will apply and must be paid before a re-inspection is scheduled to confirm correction of deficient items. See AW Fee Schedule for the current Distribution Walk-Through Re-inspection Fee.

(32) 2-inch Jumper Hose

During connections to the water distribution system, the Contractor may be required to install a temporary jumper hose between the unpressurized water segment and an adjacent pressurized water segment for the purpose of maintaining water service to customers who can't operate without water

service during the connection. The jumper shall include an approved backflow preventer and be of adequate size and pressure rating to maintain service to the customer. It shall be polyethylene tubing meeting the requirements of COA SPL WW-65. The jumper hose and other components in the temporary service shall be disinfected, and bacteriological samples will be taken and pass before the temporary service is provided to the customer. Contractor shall provide adequate protection for the jumper hose in vehicular traffic areas at all times during use.

Source: Rule No. R161-17.05 , 5-31-2017; Rule No. R161-17.19 , 11-28-2017; Rule No. R161-18.23 , 12-8-2018.

510.4 Measurement

Pipe will be measured by the linear foot for the various types, sizes and classes. Parallel lines will be measured individually.

Where a line ties into an existing system, the length of the new line will be measured from the visible end of the existing system at the completed joint. Unless otherwise indicated, the length of water, reclaimed, and wastewater lines will be measured along pipe horizontal centerline stationing through fittings, valves, manholes, and other appurtenances.

Ductile iron fittings, whether standard mechanical joint or integral factory restrained joint type, will be measured by the ton and paid for in accordance with the schedule in Standard Products List WW-27C. Bolts, glands and gaskets will not be measured for payment. Steel cylinder concrete pipe fittings and welded steel pipe fittings will not be measured separately and are included in the unit price for the respective pipe bid items.

Factory restrained joint pipe meeting the requirements of Standard Products List WW-27F will be measured by the linear foot. The estimated quantity on the bid form is only for restrained joint pipe having integral mechanically restrained joints.

Connecting a new water, wastewater, or reclaimed water service to an existing, comparable type of private service will be measured by each connection. Service pipe from the main to the service connection will be measured by the linear foot.

The Contractor shall be responsible for removing and treating ground water flowing into a trench up to a baseline flow rate of 350 gpm of sustained flow for each mainline open trench (no more that 300 linear feet open trench per work zone segment is allowed at one time). This baseline flow rate is not a prediction of ground water conditions to be expected on the Project. Rather, it establishes contract terms regarding the quantity of ground water for which the contractor is responsible without extra or separate compensation. The flow rate must exceed 350 gpm continuously for at least 4 consecutive hours to be considered sustained flow. It is expected that trench dewatering for this baseline rate may be accomplished with a single 3-inch trash-type pump per open trench; however, measured flow rate, not pump size, type or characteristics shall be used to determine if the baseline rate has been exceeded. Flow rate shall be determined by measurements made at the discharge point of the water treatment facilities. Surface storm water flowing into a trench shall be the Contractor's responsibility to remove and treat without compensation, regardless of inflow rate or volume.

Adjustment of elevations during construction resulting in changes in flow line elevations of plus or minus two feet or less will not be considered for credit or additional compensation and no measurement for payment will be made.

Stormwater pipe will be measured along the slope of the pipe. Where drainage pipe ties into inlets, headwalls, catch basins, manholes, junction boxes or other structures that length of pipe tying into the structure wall will be included for measurement but no other portion of the structure length or width will be so included.

Excavation and backfill, when included as pipe installation will not be measured as such but shall be included in the unit price bid for constructing pipe and measured as pipe complete in place including excavation and backfill.

When pay items are provided for the other components of the system, measurement will be made as addressed hereunder.

Video inspection of newly installed box culverts and storm drain pipe will be measured per linear foot of pipe videoed.

Jumper hose will be measured per linear foot of hose installed, including all depths, excavation and backfill, complete, and in place.

Source: Rule No. R161-17.05 , 5-31-2017.

510.5 Payment

Payment for pipe, measured as prescribed above, will be made at the unit price bid per linear foot for the various sizes of pipe, of the materials and type indicated, unless unstable material is encountered or trench excavation and backfill is bid as a separate item.

The concrete seal, foundation rock or coarse aggregate when used as directed in unstable material will be paid for at the unit price bid per cubic yard, which shall be full payment for all excavation and removal of unsuitable material and furnishing, placing and compacting the foundation rock, coarse aggregate or other approved material all complete in place.

Excavation and backfill, when included as a separate pay item, will be paid for by Pay Item No. 510-C or 510-D.

No separate payment will be made for dewatering a trench with ground water inflow of less than the baseline rate of 350 gpm of sustained flow as described above. Dewatering of those trenches shall be included in the contract unit price of the Pipe pay item. Payment for dewatering a trench with ground water inflow exceeding 350 gpm of sustained flow shall be agreed by change order. Dewatering of bore pits shall be included in the contract unit price for Bore Entry Pit or Exit Pit regardless of inflow rate or volume unless specified otherwise in the bid item for Bore Entry Pit or Exit Pit.

(1) Pipe

Payment for pipe, measured as prescribed above, will be made at the unit price bid per linear foot complete-in-place as designed and represented in the Drawings and other Contract documents. Restrained joint pipe meeting the requirements of Standard Products List WW-27F will be paid for separately at the unit price bid per linear foot. Unless otherwise provided herein, as separate pay item(s), the bid price per linear foot of pipe shall include the following:

a. clearing

b. constructing any necessary embankment

c. excavation

d. disposal of surplus or unusable excavated material

e. furnishing, hauling and placing pipe

f. field constructed joints, collars, temporary plugs, caps or bulkheads

g. all necessary lugs, rods or braces

h. pipe coatings and protection

i. connections to existing systems or structures, concrete blocking and thrust blocks and restrained joints

j. preparing, shaping, pumping for dewatering, and shoring of trenches

k. bedding materials

l. backfill materials

m. hauling, placing and preparing bedding materials

n. particle migration measures

o. hauling, moving, placing and compacting backfill materials

p. temporary and permanent pavement repairs and maintenance

q. temporary removal and replacement of pavement, curb, drainage structures, driveways, sidewalks and any other improvements damaged or removed during construction

r. cleanup

s. vertical stack on deep wastewater services

t. all other incidentals necessary to complete the pipe installation as indicated.

u. pipe joint restraint devices, where specified or allowed, meeting Standard Products List WW-27A or WW-27G.

No separate payment will be made for thrust restraint measures.

Steel cylinder concrete pipe fittings and welded steel pipe fittings will not be paid for separately. These will be included in the unit price bid for the bid item Pipe.

(2) Concrete Cradles and Seals

When called for in the Bid, concrete cradles and seals will be paid for at the unit Contract price bid per linear foot for the size of pipe specified, complete in place.

(3) Concrete Retards

When called for in the Bid, Concrete retards will be paid under Item No. 593S, Concrete Retards."

(4) Boring or Jacking.

When called for in the Bid, boring or jacking will be paid under Item 501S, "Jacking or Boring Pipe.

(5) Wet Connections to Potable or Reclaimed Water Mains

When called for in the bid, wet connections will be paid at the unit price bid per each, complete in place, according to the size of the main that is in service and shall be full compensation for all Work required to make the connection and place the pipe in service. (See subsection 510.3 'Construction Methods' part (24) (b) 'Wet Connections to Existing Water System').

(6) Fittings

Ductile iron fittings, furnished in accordance with these specifications, will be paid for at the unit price bid per ton, complete in place, according to the schedule of weights in Standard Products List WW-27C. Bolts, glands, and gaskets will not be paid for separately and shall be included in the contract unit price for fittings.

(7) Concrete Trench Cap and Encasement

Where the distance between the top of the concrete encasement and the top of the trench cap is less than 36 inches, the concrete cap and encasement shall be poured as one unit and paid for under this bid item at the Contract price bid per linear foot. When the distance above is greater than 36 inches or when the trench cap is placed separately, the trench cap shall be paid for as a separate item, per linear foot, complete in place.

(8) Cement-Stabilized Backfill

Cement-stabilized backfill will be paid for at the unit price bid per linear foot and shall be full payment to the Contractor for furnishing and installing the required material, mixed, placed and cured complete in place.

(9) Concrete Encasement

When called for in the Bid, Concrete Pipe Encasement will be paid under Item No. 505S, "Encasement and Encasement Pipe".

(10) Pressure Taps

Pressure taps will be paid for at the unit price bid, complete in place, according to the size tap made and the size main tapped and shall be full payment for furnishing all necessary materials, including tapping sleeve and valve, making the tap, testing and placing the connection in service.

(11) Excavation Safety Systems

When called for in Bid, Trench Safety Systems shall conform to Item No. 509S, "Excavation Safety Systems."

(12) Connecting a New Water, Wastewater, or Reclaimed Water Service to an existing, comparable type of private service will be paid for at the unit price bid, complete in place, according to the size of new service and size of existing private service, and shall be full payment for furnishing and installing all necessary materials, such as cleanouts, pipe, couplings, and fittings, and including excavation and backfill. Service pipe from the main to the service connection will be measured and paid by the horizontal linear foot.

(13) Video Inspection

Video Inspection of Newly Installed Box Culverts and Storm Drain Pipe will be paid for at the unit price bid per linear foot and shall be full payment for all labor, equipment, and materials required for video inspection per this specification, including all submittals of CD/DVD as required.

(14) Jumper Hose

Jumper Hose will be paid at the unit bid price, complete and in place, including installation and removal of all materials necessary to provide a fully functional jumper hose. This item shall also include adequate protection for the jumper hose within vehicular traffic areas.

Source: Rule No. R161-17.05 , 5-31-2017.

Payment, when included as a Contract pay item, will be made under one of the following:

Pay Item No. 510-AR___Dia.:	Pipe, ___ Dia. ___ Type (all depths), including Excavation and Backfill	Per Linear Foot.
Pay Item No. 510-ARRJ___Dia.:	Factory Restrained Joint Pipe, ___ Dia., Class ___ Ductile Iron, (all depths) including Excavation and Backfill	Per Linear Foot.
Pay Item No. 510-BR___×___Dia.:	Connecting New ___ Service to Existing Private Service (___ Dia. New Service to ___ Dia. Private Service)	Per Each.
Pay Item No. 510-CR:	Pipe Excavation, ___ Ft. Width	Per Linear Foot.
Pay Item No. 510-DR:	Pipe Trench Backfill, ___ Ft. Width	Per Linear Foot.
Pay Item No. 510-ER:	Concrete Seal or Cradle, ___ Dia. Pipe	Per Linear Foot.
Pay Item No. 510-FR:	Concrete Trench Cap, ___ Ft. Width	Per Linear Foot.
Pay Item No. 510-GR:	Concrete Cap and Encasement, ___ Dia. Pipe	Per Linear Foot.

Pay Item No. 510-HR:	Cement Stabilized Backfill, ___ Dia. Pipe	Per Linear Foot.
Pay Item No. 510-IR: ___ × ___ Dia.:	Pressure Taps, ___ Dia. × ___ Dia.	Per Each.
Pay Item No. 510-JR: ___ × ___ Dia.:	Wet Connections, ___ Dia. × ___ Dia.	Per Each.
Pay Item No. 510-KR:	Ductile Iron Fittings	Per Ton.
Pay Item No. 510-ASD___Dia.:	Pipe, ___ Dia. (all depths), including excavation and backfill	Per Linear Foot.
Pay Item No. 510-CSD:	Pipe Excavation, ___ Ft. Width	Per Linear Foot.
Pay Item No. 510-DSD:	Pipe Trench Backfill, ___ Ft. Width	Per Linear Foot.
Pay Item No. 510-ESD:	Concrete Seal or Cradle, ___ Dia. Pipe	Per Linear Foot.
Pay Item No. 510-FSD:	Concrete Trench Cap, ___ Ft. Width	Per Linear Foot.
Pay Item No. 510-GSD:	Concrete Cap and Encasement, ___ Dia. Pipe	Per Linear Foot.
Pay Item No. 510-HSD:	Cement Stabilized Backfill, ___ Dia. Pipe	Per Linear Foot.
Pay Item No. 510-AW___ Dia.:	Pipe, ___ Dia. ___ Type (all depths), including excavation and backfill	Per Linear Foot
Pay Item No. 510-AWRJ___ Dia.:	Factory Restrained Joint Pipe, ___ Dia., Class Ductile Iron, (all depths) including Excavation and Backfill	Per Linear Foot.
Pay Item No. 510-BW___ × ___ Dia.:	Connecting New ___ Service to Existing Private Service (___ Dia. New Service to ___ Dia. Private Service)	Per Each.
Pay Item No. 510-CW:	Pipe Excavation, ___ Ft. Width	Per Linear Foot.
Pay Item No. 510-DW:	Pipe Trench Backfill, ___ Ft. Width	Per Linear Foot.
Pay Item No. 510-EW:	Concrete Seal or Cradle, ___ Dia. Pipe	Per Linear Foot.
Pay Item No. 510-FW:	Concrete Trench Cap, ___ Ft. Width	Per Linear Foot.
Pay Item No. 510-GW:	Concrete Cap and Encasement, ___ Dia. Pipe	Per Linear Foot.
Pay Item No. 510-HW:	Cement Stabilized Backfill, ___ Dia. Pipe	Per Linear Foot.
Pay Item No. 510-IW:___ × ___ Dia.:	Pressure Taps, ___ Dia. × ___ Dia.	Per Each.
Pay Item No. 510-JW: ___ × ___ Dia.:	Wet Connections, ___ Dia. × ___ Dia.	Per Each.
Pay Item No. 510-KW:	Ductile Iron Fittings	Per Ton.
Pay Item No. 510-AWW: ___ Dia.:	Pipe, ___ Dia. ___ Type (all depths), including Excavation and Backfill	Per Linear Foot.
Pay Item No. 510-AWWRJ___ Dia.:	Factory Restrained Joint Pipe, ___ Dia., Class ductile Iron, (all depths) including Excavation and Backfill	Per Linear Foot.
Pay Item No. 510-BWW___ × ___ Dia.:	Connecting New ___ Service to Existing Private Service (___ Dia. New Service to ___ Dia. Private Service)	Per Each.
Pay Item No. 510-CWW:	Pipe Excavation, ___ Ft. Width	Per Linear Foot.
Pay Item No. 510-DWW:	Pipe Trench Backfill, ___ Ft. Width	Per Linear Foot.
Pay Item No. 510-EWW:	Concrete Seal or Cradle, ___ Dia. Pipe	Per Linear Foot.
Pay Item No. 510-FWW:	Concrete Trench Cap, ___ Ft. Width	Per Linear Foot.
Pay Item No. 510-GWW:	Concrete Cap and Encasement, ___ Dia. Pipe	Per Linear Foot.
Pay Item No. 510-HWW:	Cement Stabilized Backfill, ___ Dia. Pipe	Per Linear Foot.
Pay Item No. 510-KWW:	Ductile Iron Fittings	Per Ton.
Pay Item No. 510-VIDEO	Video Inspection of Newly Installed Box Culverts and Storm Drain Pipe	Per Linear Foot.

Pay Item No. 510-JH	2-inch Jumper Hose	Per Linear Foot.

An "R" after the pay item indicates the use for reclaimed water.

An "SD" after the pay item indicates the use for storm drain.

A "W" after the pay item indicates the use for water.

A "WW" after the pay item indicates the use for wastewater.

Source: Rule No. R161-17.05 , 5-31-2017.

End

Applicable References:

Standard Specifications Manual: Item Nos. Ref: 102S, 210S, 402S, 403, 501S, 505S, 506, 507S, 509S, 593S, 601S, 604S

Standards Manual: Standard 510S-1, (520 - series).

Design Criteria Manuals: Utilities Criteria Manual, Section 5.

ITEM NO. 511 WATER VALVES 11/7/22

511.1 Description

This item shall govern the valves furnished and installed as indicated on the Drawings. Unless otherwise indicated on the Drawings, all valves 4 inches and larger shall be AWWA-type valves of suitable design and fully equipped for service buried in the earth, without need for further modification and shall be wrapped with 8-mil polyethylene film with all edges and laps securely taped to provide a continuous wrap. For reclaimed water piping, the polyethylene film shall be purple. Where not indicated, the Contractor may use valves with any type end-joint allowed for fittings of the pipe class being used. Unless otherwise indicated on the Drawings, all valve stems shall be adjusted to situate the operating nut not more than 24 inches below the proposed ground or paving surface of the finished project. Laydown valves shall not be used unless called out on the Drawings. Standard details shall not be used as an indicator of available options.

Source: Rules No. R161-22.04 , 2-14-2022.

511.2 Submittals

The Contractor shall submit descriptive information and evidence that the materials the Contractor proposes for incorporation in the Work are of the kind and quality that satisfy the requirements in the Contract Documents. Austin Water (AW) shall be included in all submittal reviews. The AW Standard Products Lists (SPLs) are considered a part of the Specifications for the Work. The Contractor shall use products from the SPLs for all water and wastewater construction unless alternative products are shown on the Drawings; called for in the specifications; or specified in the Bidding Requirements, Contract Forms and Conditions of the Contract.

The products included in the SPLs current at the time of plan approval shall govern unless a specific product or products on the lists have subsequently been removed from those SPLs because of quality or performance issues. Products and materials that are not covered by the SPLs shall meet the requirements in the contract documents.

Submittals for the products and materials covered by this specification shall include manufacturer catalog sheets, technical data sheets, shop drawings, product or material test results, requirements listed below, and any other information needed to adequately describe the product or material. For products covered by SPLs, the submittal shall include a copy of the applicable SPL with the proposed product identified. An SPL by itself is not considered an adequate submittal.

A. Samples, Inspection and Testing Requirements

All tests and inspections called for by the applicable standards shall be performed by the manufacturer. Upon request, results of these tests shall be made available to the purchaser.

B. Other Requirements

Each submittal shall be accompanied by:

1. Complete data covering:
    a. the operator, including type and size, model number, etc.,
    b. the name and address of the manufacturer's nearest service facility,
    c. the number of turns to fully open or close the valve.
2. Detailed instructions for calibrating the limit stops for open and closed positions, and
3. Any other information, that may be necessary to operate and maintain the operator.

4. Complete dimensional data and installation instructions for the valve assembly as it is to be installed, including the operator.

5. Complete replacement parts lists and drawings, identifying every part for both the valve and operator.

Source: Rules No. R161-22.04 , 2-14-2022.

511.3 Materials

A. Iron-Body Gate Valves

Reduced-wall, resilient-seated gate valves for potable or reclaimed service, including tapping valves, shall conform to AWWA C-515 and SPL WW-700.

1. Stem Seals: All valves shall have approved O-ring type stem seals. At least two O-rings shall be in contact with the valve stem where it penetrates the valve body.

2. Operation: All valves shall have non-rising stems with a 2-inch square operating nut, or with a spoke type handwheel when so ordered, turning clockwise to close.

3. Gearing: Gate valves in 24-inch and larger sizes shall be geared and, when necessary for proper bury depth and cover, shall be the horizontal bevel-geared type enclosed in a lubricated gear case.

4. Bypass: Unless otherwise indicated on the Drawings, 30-inch and larger metal-seated gate valves shall be equipped with a bypass of the non-rising stem type which meets the same AWWA standard required for the main valve.

5. Valve Ends: Valve ends shall be push-on, flanged or mechanical joint, as indicated or approved.

6. Gear Case: All geared valves shall have enclosed gear cases of the extended type, attached to the valve bonnet in a manner that makes it possible to replace the stem seal without disassembly and without disturbing the gears, bearing or gear lubricant. Gear cases shall be designed and fabricated with an opening to atmosphere so that leakage past the stem seal does not enter the gear case.

7. Valve Body: Double disc gate valves in 30-inch and larger sizes installed in the horizontal position shall have bronze rollers, tracks, scrapers, etc. For reclaimed water valves, the body shall be manufactured in purple, factory painted purple, or field painted purple.

B. Reserved

C. Ball Valves

Ball valves shall be brass, bronze, stainless steel or PVC as indicated on the Drawings or Details or as approved by the Engineer or designated representative.

D. Air-Vacuum Release Valves

1. Valves shall be combination air-release, air-vacuum units having small and large orifice units contained and operating within a single body or assembled unit.

The small orifice system shall automatically release small volumes of air while the pipe is operating under normal conditions. The large air-vacuum orifice system shall automatically exhaust large volumes of air while the pipe is being filled and shall permit immediate re-entry of air while being drained.

Valves shall be rated for at least 200 psi {maximum}normal service pressure.

2. Material Requirements

Valve exterior bodies and covers shall be cast iron or reinforced nylon.

Internal bushings, hinge pins, float guide and retaining screws, pins, etc., shall be stainless steel, bronze, nylon, or Buna-N rubber.

Orifice seats shall be Buna-N rubber.

Floats shall be stainless steel, nylon, or Buna-N rubber, rated at 1,000 psi.

Unless otherwise indicated, these valves shall be as included in SPL WW-462A for water, WW-462B for reclaimed water and WW-462 for wastewater force mains.

E. Fire Hydrants

All fire hydrants shall be Dry Barrel, Traffic Model (break-away), Post Type having Compression Type Main Valves with 5 ¼ inch opening, closing with line pressure. Approved models are listed on SPL WW-3.

1. Applicable Specifications

AWWA C-502 current: "AWWA Standard for Dry-Barrel Fire Hydrants."

NFPA 1963: "National (American) Standard Fire Hose Coupling Screw Thread" and City of Austin 4 inch Fire Hose Connection Standard.

ANSI A-21.11 current: "American National Standard for Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings."

2. Functional Requirements

Design Working Pressure shall be 200 psi and a test pressure of 400 psi.

Inlet shall be side connection hub end for mechanical joint (ANSI A-21.11-current). Shoe shall be rigidly designed to prevent breakage.

Lower Barrel shall be rigid to assure above ground break at traffic feature. Bury length of hydrant shall be 4 feet minimum, 5 feet maximum (hydrant lead pipe may be elbowed up from main using restrained joints; flanged joints in lead pipes are not allowed). Flange type connections between hydrant shoe, barrel sections and bonnet shall have minimum of six corrosion resistant bolts.

Hydrant Main Valve shall be 5 ¼ inch I.D. Valve stem design shall meet requirements of AWWA C502, with Operating Nut turning clockwise to close. Operating Nut shall be pentagonal, 1½ inch point to flat at base, and 1-7/16 inches at top and 1 inch minimum height. Seat ring shall be bronze (bronze to bronze threading) and shall be removable with lightweight stem wrench. Valve mechanisms shall be flushed with each operation of valve; there shall be a minimum of two drain ports.

Traffic Feature shall have replaceable breakaway ferrous metal stem coupling held to stem by readily removable type 302 or 304 stainless steel fastenings. Breakaway flange or frangible lugs shall be designed to assure aboveground break. Breakaway or frangible bolts will not be acceptable.

Outlet Nozzles shall be located approximately 18 inches above ground. Each hydrant shall have two 2½ inch nozzles 180 degrees apart with National (American) Standard Fire Hose Coupling Screw Thread NFPA 1963 and one 4 inch pumper nozzle with City of Austin (COA) standard thread-six threads per inch "Higbee" cut, 4.8590 inch O.D., 4.6425 inch root diameter. Nozzles shall be threaded or cam-locked, O-ring sealed, and shall have type 302 or 304 stainless steel locking devices. Nozzle caps (without chains) and cap gaskets shall be furnished on the hydrant. The cap nut shall have the same configuration as the operating nut.

Hydrants shall be Dry-Top Construction, factory lubricated oil or grease with the lubricant plug readily accessible. The system shall be described for City approval.

A blue Type II-B-B reflectorized pavement marker, conforming to Standard Specification Item No. 863S, shall be placed 2 to 3 feet offset from the centerline of paved streets, on the side of and in line with, all newly installed fire hydrants.

Hydrant shall have double O-ring seals in a bronze stem sheath housing to assure separation of lubricant from water and shall have a weather cap or seal, or both, as approved by the Owner, to provide complete weather protection.

3. Material Requirements

All below ground bolts shall be corrosion resistant. The hydrant valve shall be Neoprene, 90 durometer minimum. The seat ring, drain ring, operating nut and nozzles shall be bronze, AWWA C-502 current, containing not over 16 percent zinc. Break-away stem coupling shall be of ferrous material; its retaining pins, bolts, nuts, etc. of type 302 or 304 stainless steel.

Coatings shall be durable and applied to clean surfaces. Exterior surfaces above ground shall receive a coating of the type and color specified in the applicable version of AW SPL WW-3. The coating shall be applied according to coating manufacturer's specifications. Other exposed ferrous metal shall receive asphalt-based varnish, or approved equal, applied according to the coating manufacturer's specifications.

F. Pressure/Flow Control Valves

All control valves to regulate pressure, flow, etc., in City lines shall be models listed in the AW SPL WW-319 and shall conform to AWWA C530.

G. Drain Valves

Drain valve materials and installation shall conform to COA Standard 511-AW-03.

H. Valve Stem Extensions:

Valve stem extensions shall consist of a single piece of the required length with a socket on one end and a nut on the other.

Source: Rules No. R161-22.04 , 2-14-2022.

511.4 Construction Methods

A. Setting Valves, Drains and Air Releases

Unless otherwise indicated, main line valves, drain valves and piping, air and vacuum release assemblies and other miscellaneous accessories shall be set and jointed in the manner described for cleaning, laying, and jointing pipe.

Unless otherwise indicated, valves shall be set at the locations shown on the Drawings and such that their location does not conflict with other appurtenances such as curb ramps. Valves shall be installed so that the tops of operating stems will be at the proper elevation required for the piping at the location indicated above. Valve boxes and valve stem casings shall be firmly supported and maintained, centered and aligned plumb over the valve or operating stem, with the top of the box or casing installed flush with the finished ground or pavement in existing streets, and installed with the top of the box or casing approximately 6 inches below the standard street subgrade in streets which are excavated for paving construction or where such excavation is scheduled or elsewhere as directed by the Engineer or designated representative.

Drainage branches or air blowoffs shall not be connected to any sanitary sewer or submerged in any stream or be installed in any other manner that will permit back siphonage into the distribution system (see COA "Standard Series 500"). Every drain line and every air release line shall have a full sized independent gate valve flanged directly to the main. Flap-valves, shear gates, etc., will not be accepted.

B. Setting Fire Hydrants

Fire hydrants shall be located in a manner to provide accessibility and in such a manner that the possibility of damage from vehicles or conflict with pedestrian travel will be minimized. Unless otherwise directed, the setting of any hydrant shall conform to the following:

Hydrants between curb and sidewalk on public streets, shall be installed as shown on Standard 511-AW-02, with outermost point of large nozzle cap 6 inches to 18 inches behind back of curb. Where walk abuts curb, and in other public areas or in commercial areas, dimension from gutter face of curb to outermost part of any nozzle cap shall be not less than 3 feet, nor more than 6 feet, except that no part of a hydrant or its nozzle caps shall be within 6 inches of any sidewalk or pedestrian ramp. Any fire hydrant placed near a street corner shall be no less than 20 feet from the curb line point of tangency. Fire hydrants shall not be installed within 9 feet vertically or horizontally of any sanitary sewer line regardless of construction.

All hydrants shall stand plumb; those near curbs shall have the 4-inch nozzle facing the curb and perpendicular to it. The hydrant bury mark shall be located at ground or other finish grade; nozzles of all new hydrants shall be approximately 18 inches above grade. Lower barrel length shall not exceed 5 feet. Barrel extensions are not permitted unless approved by the Engineer or designated representative. Each hydrant shall be connected to the main by 6-inch ductile iron pipe; a 6-inch gate valve shall be installed in the line for individual shutoff of each new hydrant.

Below each hydrant, a drainage pit 2 feet in diameter and 2 feet deep shall be excavated and filled with compacted coarse gravel or broken stone mixed with coarse sand under and around the bowl of the hydrant, except where thrust blocking is located (COA Specification Item 510 and Standard 510-6) and to a level 6 inches above the hydrant drain opening.

The hydrant drainage pit shall not be connected to a sanitary sewer. The drain gravel shall be covered with filter fabric to prevent blockage of voids in the gravel by migration of backfill material. The bowl of each hydrant shall be well braced against unexcavated earth at the end of the trench with concrete thrust blocking (taking care not to obstruct the hydrant drain holes), or the hydrant shall be tied to the pipe with approved metal harness rods and clamps. The fire line shall be provided with joint restraint from the main line to the fire hydrant. Hydrants shall be thoroughly cleaned of dirt or foreign matter before setting.

Fire hydrants on mains under construction shall be securely wrapped with a poly wrap bag or envelope taped into place. When the mains are accepted and placed in service the bag shall be removed.

C. Pressure Taps: Refer to Section 510.3 (24) of Standard Specification Item Number 510, "Pipe."

D. Plugging Dead Ends

Standard plugs shall be inserted into the bells of all dead ends of pipes, tees or crosses and spigot ends shall be capped. All end plugs or caps shall be secured to the pipe conforming to Section 510.3 (22) of Standard Specification Item Number 510, "Pipe."

E. Protective Covering

Unless otherwise indicated, all flanges, nuts, bolts, threaded outlets and all other steel component shall be coal tar coated and shall be wrapped with standard minimum 8-mil low density polyethylene film or a minimum 4-mil cross laminated high-density polyethylene meeting ANSI/AWWA Specification C-105-current, with all edges and laps taped securely to provide a continuous and watertight wrap. Repair all punctures of the polyethylene, including those caused in the placement of bedding aggregates, with duct tape to restore the continuous protective wrap before backfilling. For reclaimed water piping, the polyethylene shall be purple.

F. Valve Box, Casing and Cover

Stems of all buried valves shall be protected by valve box assemblies. Valve box castings shall conform to ASTM A 48, Class 30B. Testing shall be verified by the manufacturer at the time of shipment. Each casting

shall have cast upon it a distinct mark identifying the manufacturer and the country of origin. Valve boxes and covers for potable water shall be round. Valve boxes and covers for reclaimed water piping shall be square and shall have "Reclaimed Water" indicated on the lid.

G. Drain Valve Installations

Refer to Standard 511-AW-03.

H. Air Release Assemblies

Refer to Standard 511-AW-04.

I. Pressure/Flow Control Valves

Refer to Standard Specification Item No. 512, “Pre-Cast Water Utility Vaults”, and Standard 512-AW-01.

J. Connections to Existing System

Refer to Standard Specification Item No. 510, "Pipe" for connections to the existing system.

K. Shutoffs

Refer to Standard Specification Item No. 510, "Pipe" for shutoffs.

Source: Rules No. R161-22.04 , 2-14-2022.

511.5 Measurement

All types of valves will be measured per each. Fire hydrants and drain valve assemblies will be measured per each. Fire Hydrant barrel extensions will be measured per vertical foot. Pressure/Flow control valve assemblies will be measured in accordance with Standard Specification Item 512, “Pre-Cast Water Utility Vaults.” Manual and automatic air release assemblies will be measured per each. Reflectorized pavement markers for identifying the location of newly installed fire hydrants will be measured per each, as per Standard Specification Item No. 863S.7.

Bury depths exceeding 5.5 feet are defined as Additional Bury Depths. Additional bury depths will only be measured if indicated on the Drawings and identified in the Standard Contract Bid Form 00300U; otherwise, the unit bid price for each completed unit includes all depths.

Source: Rules No. R161-22.04 , 2-14-2022.

511.6 Payment

Payment shall include full compensation, in accordance with the pay item established in the bid, for excavation, furnishing, hauling and placing valves, drain valve assemblies, fire hydrants and barrel extensions including anchorage and all incidental materials and work; preparing, shaping, dewatering, bedding, placing and compacting backfill materials and for all other incidentals necessary to complete the installation, as indicated in the Drawings, complete in place.

Payment for iron fittings and for wet connections is covered in Section 510.6 of Standard Specification Item 510, "Pipe."

Payment for excavation safety systems is covered in Section 509S.10 of Standard Specification Item 509S, “Excavation Safety Systems.”

A. Valves: Valves will be paid for at the unit bid price for the size and type valve installed, including valve stem casing and cover, excavation and backfill, setting, adjusting to grade, anchoring in place, and other appurtenances necessary for proper operation.

B. Fire Hydrants: Fire Hydrants installation shall be paid for at the unit bid price, which includes all necessary labor and materials to set, adjust to grade and anchor the hydrant body, barrel extensions, concrete block, gravel drain and other appurtenances necessary for proper operation; but shall not include pipe and valve between the main line and fire hydrant base.

C. Pressure or Flow Control Valve Assemblies: Pressure control and flow control valve assemblies will be paid for in accordance with Standard Specification Item 512, “Pre-Cast Water Utility Vaults.”

D. Drain Valve Assemblies: Drain valve installation shall be paid for at the unit bid price, which includes all necessary labor and materials to set, adjust to grade and anchor the bends, vertical piping, blind flange, joint restraint devices, concrete blocking, concrete pad the drain valve, setting, adjusting to grade, anchoring in place, and other appurtenances necessary for proper operation; but shall not include pipe and valve between the main line and drain valve buried bend.

E. Manual Air Release Assemblies: Manual air release installations will be paid for at the unit bid price and shall include valves, fittings, pipe, tapping the main, box and cover, and other appurtenances necessary for proper operation.

F. Automatic Combination Air/Vacuum Release Valve Assembly: Automatic air-vacuum release assemblies will be paid for at the unit bid price and will include the main line tap or outlet, all pipe, valves, fittings, box or vault and cover, and other appurtenances necessary for proper operation.

G. Additional Bury Depth: Additional bury depth will be paid for at the unit bid price, which will include all work necessary to install units with bury depths exceeding 5.5 feet.

H. Fire Hydrant Barrel Extensions: Hydrant barrel extensions will be paid for at the unit bid price which will include necessary hardware and rod extensions.

I. Reflectorized Pavement Markers: Pavement markers will be paid for at the unit bid price, which will include necessary surface preparation and adhesive, as per Standard Specification Item No. 863S.8.

Payment, when included as a contract pay item, will be made under one of the following:

Pay Item No. 511-A:	Valves, _____ Type, ___ Diameter	Per Each.
Pay Item No. 511-B:	Fire Hydrants (See Standard No. 511-AW-02)	Per Each.
Pay Item No. 511-D:	Drain Valve Assemblies (See Standard No. 511-AW-03)	Per Each.
Pay Item No. 511-E:	Manual Air Release Assemblies, ____Diameter	Per Each.
Pay Item No. 511-F:	Automatic Combination Air/Vacuum Release Valve Assembly, ___ Diameter.	Per Each.
Pay Item No. 511-G:	Additional Bury Depth	Per Vertical Foot.
Pay Item No. 511-H:	Fire Hydrant Barrel Extensions	Per Vertical foot.

Source: R161-22.04 , 2-14-2022.

END

SPECIFIC CROSS REFERENCE MATERIALS	
Standard Specification Item No. 511, "Water Valves"	
COA Standard Specification Items	
Designation	Description
Item 510	Pipe
Item 510.3 (22)	Pipe Anchorage, Support and Protection
Item 510.3(24)	Water System Connections

COA Standard Details	
Designation	Description
511-AW-04	Air Release and Air/Vacuum Valve
511-AW-03	Drain Valve
511-AW-02	Fire Hydrant
AW SPLs	
Designation	Description
SPL WW-282	Resilient-Seated Gate Valves, AWWA C-509
SPL WW-367	Air Release Valves for Water
SPL WW-462	Air Release/Vacuum Relief Valves for Wastewater
SPL WW-700	Resilient-Seated Gate Valves, AWWA C-515
ANSI/AWWA Standards	
Designation	Description
A-21.11	American National Standard for Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings
C-105	American National Standard for Polyethylene Encasement for Ductile-Iron Pipe
C-500	Metal-Seated Gate Valves for Water Supply Service
C-502	Dry-Barrel Fire Hydrants
C-504	Rubber-Seated Butterfly Valves
C509	Resilient Seated Gate Valves for Water and Sewerage Systems
C-515	Reduced-Wall, Resilient-Seated Gate Valves For Water Supply Service-515
ASTM Standards	
Designation	Description
ASTM A48/A48M	Specification for Gray Iron Castings
ASTM A 536	Specification for Ductile Iron Castings
National Fire Protection Association (NFPA)	
1963 National (American) Standard Fire Hose Coupling Screw Thread	

RELATED CROSS REFERENCE MATERIALS	
Specification 511, "Water Valves"	
COA Standard Specification Items	
Designation	Description
Item No. 501	Jacking or Boring Pipe
Item No. 503	Frames, Grates, Rings and Covers
Item No. 505	Concrete Encasement and Encasement Pipe
Item No. 506	Manholes
Item No. 507	Bulkheads
Item No. 508	Miscellaneous Structures and Appurtenances
Item No. 509	Trench Safety Systems

Item No. 700S
Mobilization

700S.1 Description

This item shall govern the mobilization of personnel, equipment and materials at the work site for other contract items that will be performed by the Contractor. Mobilization shall include, but not be limited to the movement of equipment, personnel, material, supplies, etc. to the Work site; the installation of temporary facilities (when not paid for separately) and the establishment of office and other necessary facilities prior to the initiation of the Work. The cost of the Payment Bond and Performance Bond on the Work that is delayed due to circumstances beyond Contractor's control, a closed construction season or for the convenience of the City of Austin will be considered part of the mobilization item under this Contract.

700S.2 Measurement.

Measurement of the Specification Item, "Mobilization", as specified herein as "Total Mobilization Payment", will be by the "Lump Sum", as the Work progresses.

700S.3 Payment.

The adjusted contract amount as used below is defined as the original contract amount less the lump sum bid for Mobilization and any payments for materials or equipment not yet incorporated in the Work. The Contractor shall submit a lump sum amount for Payment Item No. 700S-TM, "Total Mobilization Payment".

"Initial Mobilization Payout" as used below is defined as:

1. 8% of the original contract amount for projects with an original contract amount of $ 0.5 million or less; or
2. 4% of the original contract amount for projects with an original contract amount greater than $ 0.5 million.

In those instances where the "Initial Mobilization Payout", as defined above, exceeds the "Total Mobilization Payment" lump sum bid item (i.e. Payment Item No. 700S-TM), the "Total Mobilization Payment" shall be used as the "Initial Mobilization Payout". In no instance shall the "Initial Mobilization Payout" exceed the "Total Mobilization Payment" bid item.

Partial payments of the "Initial Mobilization Payout" shall be as follows:

A. Upon presentation of a paid invoice for the Payment Bond, Performance Bond and/or required insurance, the Contractor will be paid that cost from the amount bid for "Total Mobilization Payment".

B. The Mobilization of tunnel boring machines, batch plants or other similar facilities, along with supporting materials and equipment, to the work site or to the vicinity of the Work site will be considered as partial Mobilization under this contract. The Contractor shall provide a certified statement of the Contractor's

expenditure for the Mobilization and setup of the facility and supporting equipment. Upon approval by the Engineer or designated representative, the certified expenditure will be paid from the amount bid for the Specification Item, “Total Mobilization Payment”. In no case shall the combined amount for all of these facilities be more than 10 percent of the Mobilization “Total Mobilization Payment" lump sum bid or one (1) percent of the total contract amount, whichever is less.

C. When one (1) percent of the adjusted contract amount is earned, 50 percent of the "Initial Mobilization Payout” will be paid. Previous payments under this item will be deducted from this amount.

D. When five (5) percent of the adjusted contract amount is earned, seventy-five (75) of the "Initial Mobilization Payout” will be paid. Previous payments under this item will be deducted from this amount.

E. When ten (10) percent of the adjusted contract amount is earned, one hundred (100) percent of the "Initial Mobilization Payout” will be paid. Previous payments under this item will be deducted from this amount.

F. Payment for the remainder of Pay Item No. 700S-TM, “Total Mobilization Payment” will be made upon receipt of the final pay estimate.

Payment will be made under:

Pay Item No. 700S-TM: **"**Total Mobilization Payment" Lump Sum

END

RELATED CROSS REFERENCE MATERIALS
Specification 700S, “MOBILIZATION”

City of Austin Standard Contract Documents

Designation	Description
00020	Invitation for Bids
00100	Instructions To Bidders
00300	Bid Form
00425	Insurance Cost Form
00500	Agreement
00610	Performance Bond
00620	Bid Bond
00650	Certificate of Insurance
00700	General Conditions
00810	Supplemental General Conditions
00820	Modifications to Bidding Requirements & Contract Forms
01010	Summary of Work
01300	Submittals
01500	Temporary Facilities
01550	Public Safety and Convenience
01700	Contract Closeout
01710	Final Cleaning

ITEM NO. 802S PROJECT SIGNS 9-14-21

802S.1 Description

This item shall govern furnishing, fabricating, erecting, maintaining and removing Project Signs on Capital Improvement Projects (C.I.P.), Bond Program Projects and for project identification at other construction sites, when required on the Drawings. The C.I.P. signs shall be constructed in accordance with Standards 802S-1, 802S-1A, 802S-2, 802S-2A, 802S-2B and 804S-5 or as indicated on the Drawings.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text, the inch-pound units are given preference followed by SI units shown within parentheses.

802S.2 Materials

A. Sign Face

Sign face shall be manufactured on standard exterior waterproof plywood sheets or other suitable material approved by the Engineer or designated representative. Unless indicated otherwise on the Standard Details or Drawings, the thickness of the plywood sheet shall be a minimum of ¾ inches (19 mm).

B. Posts

Lumber posts, of the size indicated on the Standard Details or on the Drawings, shall be pressure treated with pentachlorophenol.

C. Paint

Exterior oil base paint, colors as indicated on the Standard Details or on the Drawings.

D. Decals for Capital Improvement Projects and Bond Program Projects

City seal shall be in color using the 4 color process. Electronic images, in EPS format, are available from the Public Works Website (www.ci.austin.tx.us/publicworks/techspecs.htm) for downloading.

802S.3 Installation

The signs shall be erected at each major entrance to the project for maximum public identification and exposure. At locations where construction is confined to a specific area, the installed sign size shall be 4 foot x 8 foot (1.2 meter x 2.4 meter). At locations where C.I.P. roadway construction is in progress, such as a street paving or construction of a sidewalk, the sign shall be 2 foot x 3 foot (0.2 meter x 0.8 meter). Signs for Bond Program Projects shall be 3 x 4 foot (0.9 x 1.2 meters).

The signs shall be posted on portable wood frames or stanchions and will be located in the proximity of the work area as construction progresses. All lumber shall be painted with two coats of paint as indicated herein, on the Standard Details or in the Drawings.

In special cases the size of the sign may be changed to meet special requirements, but general proportions shall be maintained.

It shall be the responsibility of the contractor to maintain and relocate signs, if necessary during the progression of the project. Care shall be exercised to assure that placement of the signs does not interfere with or cause sight obstruction to vehicular and pedestrian traffic.

For projects located on a street with curb and gutter, signs shall be installed no closer than 2 feet (0.6 meter) from the face of curb on the street.

For projects located on a street without curb and gutter, signs shall be installed no closer than 6 feet (1.8 meters) from the edge of street pavement.

The contractor may install, at the Contractor's own expense, company signs to identify the contractor, architectural firm, etc. Signs are to be securely attached to the posts at locations indicated on the drawings and shall not be larger than 18 x 36 inches (0.45 x 0.90 meter).

802S.4 Measurement

In the CIP contract and/or Bond Program, signs shall be measured by either lump sum or per each.

802S.5 Payment

The work performed and the materials furnished as prescribed by this item shall be paid for by lump sum or per each price bid only. The "lump sum" bid or "per each" price bid shall include full compensation for all work performed and all materials furnished in constructing, transporting, temporarily storing and relocating as required, and maintaining and removing the signs as specified on the Drawings and as directed by the Engineer or designated representative.

Payment will be made under one of the following:

Pay Item No. 802S-AC.I.P.:	C.I.P.Project Signs	Lump Sum.
Pay Item No. 802S-BC.I.P.:	C.I.P. Project Sign	Per Each.
Pay Item No. 802S-ABOND:	Bond Project Signs	Lump Sum.
Pay Item No. 802S-BBOND:	Bond Project Sign	Per Each.

Source: Rule No. R161-21.17 , 9-14-2021.

End

SPECIFIC CROSS REFERENCE MATERIALS	
Specification Item No. 802S, "Project Signs"	
City of Austin Standard Details	
Designation	Description
Item No. 802S-1	2.4 m × 1.2 m (8′ × 4′) C.I.P. Building Project Sign
Item No. 802S-1A	2.4 m × 1.2 m (8′ × 4′) Bond Program Building Project Sign
Item No. 802S-2	600 mm × 900 mm (24″ × 36″) C.I.P. Movable Sign Type II
Item No. 802S-2A	600 mm × 900 mm (24″ × 36″) Joint C.I.P. Movable Sign Type II
Item No. 802S-2B	900 mm × 1.2 m (36″ × 48″) Bond Program Project Movable Sign Type II
Item No. 804S-5	Typical CMTA/C.I.P. Sign Locations

Item No. 803S
Barricades, Signs and Traffic Handling

803S.1 Description

This item shall govern for providing, installing, moving, replacing, maintaining, cleaning and removing upon completion of the work, all temporary or permanent street closure barricades, signs, cones, lights or other devices required to handle the traffic in conformance with the current edition of the Texas Manual of Uniform Traffic Control Devices for Street and Highways and as indicated on the Drawings or directed by the Engineer or designated representative.

Constructing A Detour, if required, shall conform to Standard Specification Item No. 801S, " Constructing A Detour". Capital Improvement Project Signs shall conform to Standard Specification Item No. 802S, " Project Signs".

This item shall also include the installation of all required safety fencing as described in the latest adopted version of Standard Detail 804S-4.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text, the inch-pound units are given preference followed by SI units shown within parentheses.

803S.2 Submittals

The submittal requirements of this specification item include:

A. Type of Barricade and proposed materials and Construction of the barricade,

B. Test results for Retro-Reflective sheeting.

803S.3 Materials

All barricades, signs, cones, lights and other types of devices to handle traffic, as indicated on the Drawings or directed by the Engineer or designated representative, shall conform to details shown on the Drawings or those indicated in the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

803S.4 Construction Methods

Prior to commencement of construction, suitable "Barricades, Signs and Traffic Handling" devices shall be installed to protect the workers and the public.

The Contractor shall be responsible for the installation of all markers, signs and barricades in accordance with the Drawings and in conformance with the Texas Manual on Uniform Traffic Control Devices (TMUTCD) and/or as indicated on the Drawings or directed by the Engineer or designated representative. If, in the opinion of the Engineer or designated representative, additional markers, signs or barricades are needed in the interest of safety, the Contractor will install such as are required or as directed by the Engineer or designated representative. All changes and/or revisions to the detour/traffic control plan shall be approved by the Engineer or designated representative.

Lumber shall be painted with 2 coats of paint as indicated on the Drawings.

803S.5 Maintenance

It shall be the Contractor's responsibility to maintain, clean, move and replace if necessary, barricades, signs and traffic handling devices during the time required for construction of the project. Permanent barricades shall be constructed as required after the completion of the street by drilling holes to place the posts and concrete foundations. Foundation concrete shall be cured before the rails are attached. When no longer needed, all temporary Barricades, Signs and Traffic Handling Devices shall be removed and the area restored to its original condition or as directed by the Engineer or designated representative.

803S.6 Measurement

The work performed and material furnished as prescribed by this item, City of Austin Standard Details, details included on the Drawings or indicated in the TMUTCD shall be measured as follows:

A. Pavement Markings.

All pavement marking required for proper installation of the designated Traffic Control Plans and Details, as well as required removal of existing pavement marking, shall be measured and paid for under Standard Specification Item No. 870S, “Work Zone Pavement Markings” and Standard Specification Item No. 874S, “Eliminating Existing Pavement Markings”.

B. Barricades, Signs and Traffic Handling.

All work performed and material furnished as prescribed by this item, City of Austin Standard Details, details shown on the Drawings or indicated in the TMUTCD, that are not included in the above paragraph, shall be measured by the number of calendar days, working days or months of actual service.

Traffic control for the project will be measured and paid for once per contract defined time period, i.e. either per Calendar Day, Working day or Month at the contract rate, regardless of the number of set-ups, locations or streets under construction.

C. Safety Fencing

Safety fencing will be measured by the lineal foot.

803S.7 Payment

The work performed and materials furnished as prescribed by this item, measured as provided under section “803S.6 Measurement” shall be paid for at the contract unit price for barricades, signs and traffic handling. This unit price shall include full compensation for furnishing, placement and removal of all materials and for all labor, tools, equipment, and incidentals necessary to complete the work.

Payment will be made under:

Pay Item No. 803S -CD:	Barricades, Signs, and Traffic Handling	Per Calendar Day.
Pay Item No. 803S-WD:	Barricades, Signs, and Traffic Handling	Per Working Day.
Pay Item No. 803S-MO:	Barricades, Signs, and Traffic Handling	Per Month.
Pay Item No. 803S-SF:	Safety Fence	Per Lineal Foot.

End

SPECIFIC CROSS REFERENCE MATERIALS
Specification Item No. 803S, "Barricades, Signs and Traffic Handling"

City of Austin Standard Specifications

Designation	Description
Item No. 801S	Constructing A Detour
Item No. 802S	Project Signs
Item No. 870S	Work Zone Pavement Markings
Item No. 874S	Eliminating Existing Pavement Markings and Markers

Texas Technical Documents:

Designation	Description
(TMUTCD)	Texas Manual on Uniform Traffic Control Devices

RELATED CROSS REFERENCE MATERIALS
Specification Item No. 803S, "Barricades, Signs and Traffic Handling"

City of Austin Standard Specifications

Designation	Description
Item No. 403S	Concrete for Structures
Item No. 860S	Pavement Marking Paint (Reflectorized)
Item No. 863S	Reflectorized Pavement Markers
Item No. 864S	Abbreviated Pavement Markings
Item No. 867S	Epoxy Adhesive
Item No. 871S	Reflectorized Pavement Markings
Item No. 875S	Pavement Surface Preparation For Markings

City of Austin Standard Details

Designation	Description
803S-1	Street-End Barricades

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 502	Barricades, Signs and Traffic Handling
Item No. 508	Constructing Detours
Item No. 510	One-Way Traffic Control
Item No. 512	Portable Concrete Traffic Barrier
Item No. 514	Permanent Concrete Traffic Barrier
Item No. 662	Work Zone Pavement Markings
Item No. 666	Reflectorized Pavement Markings
Item No. 667	Prefabricated Pavement Markings
Item No. 672	Raised Pavement Markers
Item No. 677	Eliminating Existing Pavement Markings and Markers
Item No. 678	Pavement Surface Preparation For Markings

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SPECIAL PROVISION
To Standard Specification 510 (dated 11/07/22)
Pipe

For this project, City of Austin Standard Technical Specification Item 510 (dated 11/07/22), "Pipe", is hereby amended with respect to the clauses cited below. No other clauses or requirements of this Section of the City of Austin Standard Specifications are waived or changed.

1. Delete Section 510.3 Subsection (27) Pressure Pipe Hydrostatic Testing and replace with the following:

   "Reference Special Specification 02687, "Testing of Installed Piping Systems" for information regarding hydrostatic and leakage testing of installed pressurized piping systems."

End

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SPECIAL PROVISION
To Standard Specification 700S (dated 09/26/12)
Mobilization

For this project, City of Austin Standard Technical Specification Item 700S (dated 09/26/12), "Mobilization", is hereby amended with respect to the clauses cited below. No other clauses or requirements of this Section of the City of Austin Standard Specifications are waived or changed.

1. Delete Section 700S.3.C and replace with the following:

"CONTRACTOR shall minimize the amount of time on site until installation is ready to begin. CONTRACTOR shall coordinate work such that all major equipment items with long lead times shall have submittals approved by ENGINEER prior to CONTRACTOR mobilizing at the site. The Contract time accounts for lead times for equipment but does not imply that the CONTRACTOR needs to mobilize to the site at the beginning of the Contract. CONTRACTOR shall mobilize to the site no sooner than one (1) month prior to anticipated delivery date of major mechanical equipment.

When one (1) percent of the adjusted contract amount is earned, 50 percent of the "Initial Mobilization Payout" will be paid. Previous payments under this item will be deducted from this amount."

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SECTION 02687

TESTING OF INSTALLED PIPING SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Scope: Furnish all labor, materials, tools, and equipment, and perform all operations in connection with testing of installed piping systems and appurtenances.

B. PLANS show pipe sizes, arrangements, working pressures, and test pressures. When PLANS lack such information, minimum test pressures specified in Attachment “B” herein to be used.

1.02 RELATED REQUIREMENTS

A. Piping materials and installation requirement as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATIONS Sections.

1.03 – 1.11 (NOT USED)

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. All testing to be conducted by the Contractor in the presence of OWNER/ENGINEER and/or local reviewing authority. A minimum of 24 hours notice is required prior to commencing tests. Length of piping and sections included in tests to meet with approval of OWNER/ENGINEER. The CONTRACTOR shall furnish all necessary assistance for conducting the tests.

B. Water for Testing
1. Except for potable water lines, non-potable water may be used for testing.
2. CONTRACTOR is responsible for conveying and ultimate disposal of water used for testing.
3. If potable water is used for testing CONTRACTOR is responsible for metering.
4. Reference the General Conditions for the disposition of costs associated with the purchase of potable water or non-potable water.
5. All costs associated with re-testing to be borne by CONTRACTOR.

C. Furnish all taps, fittings, blind flanges, bulkheads, bracing systems, plugs, pumps, gauges and other devices for use in filling, flushing, and testing.

D. Piping installed behind walls, under pavement, or under structures to be tested prior to construction of same.

E. Thrust Blocks: No testing is to be performed until the installation of all thrust blocking has been completed and given sufficient time to cure. Testing is not to begin until a minimum of 36 hours has elapsed since the last thrust block has been poured when utilizing high, early strength concrete for thrust blocking. A minimum of 7 days of thrust block curing is required when utilizing standard concrete.

F. Pipes to be free of dirt, sand, gravel, or other foreign material prior to testing.

G. Protect all valves and appurtenances, in or attached to piping system, from damage due to testing procedures. Any damage resulting from testing procedures to be repaired, and all costs to be borne by CONTRACTOR.

H. When testing absorbent pipe materials, such as concrete, fill the system with water and allow to stand for 24 hours prior to conducting test. Air testing is not to be used with these materials.

I. All fittings, hydrants, and appurtenances to be properly braced and harnessed before the testing commences. Thrust restraining devices which are part of the piping system to be tested at the test pressure.

J. Plug pipe outlets with test plugs, blind flanges or bulkheads. Brace valves, fittings, and plugs securely to prevent blowouts.

K. Furnish adequate venting facilities in system to allow air to escape when filling system for hydrostatic testing.

L. Pressurizing equipment to include a regulator set to avoid over-pressurization of test lines.

M. CONTRACTOR is solely responsible for implementing and adhering to recognized safety procedures to prevent injury to personnel and/or damage to property.

N. For underground lines, backfill to a sufficient depth of cover prior to testing to prevent shifting of the pipe due to pressure.

O. CONTRACTOR to determine groundwater level by installing groundwater gauges in manholes prior to conducting low pressure air tests or testing underground pipes for infiltration and/or exfiltration. Gauges to consist of a rigid section of minimum 1/2-inch diameter pipe, capped and inserted horizontally in manhole wall as near as possible to top of sewer, sealed so as to be watertight. Immediately prior to performance of test, groundwater back pressure to be determined by removing pipe cap, blowing air through pipe into ground to clean pipe, then connecting a clear plastic tube to pipe. Clear plastic tube to be held vertically and measurement of height (in feet) of water over invert of pipe to be taken after water has stopped rising. Upon completion of air test, remove groundwater gauge from wall of manhole and permanently close opening with a nonshrinking, noncorrosive grout.

P. Test pressure is not to exceed rated pressure of valves installed in line.

3.02 HYDROSTATIC TESTING – HIGH HEAD (HH)

A. Test Pressure: Unless otherwise specified in the test schedule herein or the piping schedule on the PLANS, the following pressure restrictions to apply:
   1. Test Pressure
      a. 150% of the working pressure at the point of testing; or
      b. 125% of the working pressure at the highest point along the test section.
      c. In the event of a conflict between a. and b. above, the greater value is to apply.
   2. For surcharged piping systems, working pressure is defined as the difference in elevation between the lowest point in the piping system and the maximum water surface elevation in the hydraulic structure immediately upstream of the piping system.
   3. Test pressure is not to vary by more than plus or minus 5 psi.

B. Duration of Pressure Test: Exposed joints to be tested for not less than 2 hours with no allowable leakage. Covered joints to be tested for a minimum of 6 hours. If leakage at the end of the 6-hour period exceeds the allowable by less than 25%, test to continue for not less than 18 additional hours. For test durations greater than 2 hours, furnish a calibrated pressure recorder to record pressure during test. Reference Paragraph 3.10 for allowable leakage.

C. Pressurization: Each valved section of pipe to be filled with water slowly and the specified test pressure, based on the elevation of the highest point of the line or section under test and corrected to the elevation of the test gauge, to be applied by means of a pump connected to the pipe. Furnish pump, pipe connections, and necessary apparatus, gauge, volumetric measuring device and meters. Furnish necessary labor and assistance for conducting test, all subject to approval by ENGINEER.

D. Air Removal: Before applying the specified test pressure, air to be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, CONTRACTOR to install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks to be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks to be removed and plugged, or left in place at the discretion of the OWNER.

E. Examination: All exposed pipe, fittings, valves, hydrants, and joints to be examined carefully during the test. Any damage or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test to be repaired or replaced with sound material and the test repeated until the leakage is within the specified allowance.

3.03 TESTING GRAVITY FLOW PIPING – (GR)

A. Test gravity flow piping indicated with “GR” in the Piping Schedule, as follows:
   1. Unless specified otherwise, subject gravity flow piping to the following tests:
      a. Alignment and grade.
      b. For plastic piping test for deflection.
      c. Visible leaks and pressure with maximum leakage allowance, except for storm drains and culverts.
   2. Inspect piping for visible leaks before backfilling.
   3. Provide temporary restraints when needed to prevent movement of piping.
   4. Pressure test piping as required for hydrostatic test, with maximum leakage allowance after backfilling.
   5. With the lower end plugged, fill piping slowly with water while allowing air to escape from high points. Keep piping for at least 24 hours:
      a. Examine piping for visible leaks. Consider examination complete when no visible leaks are observed.
      b. Maintain piping with water, or allow a new water absorption period of 24 hours for the pressure test with maximum leakage allowance.
      c. After successful completion of the test for visible leaks and after the piping has been restrained and backfilled, subject piping to the test pressure for minimum of 4 hours while accurately measuring the volume of water added to maintain the test pressure:
         (1) Consider the test complete when leakage is equal to or less than the following maximum leakage allowances:
            (a) For concrete piping with rubber gasket joints: 80 gallons per day per inch of diameter per mile of piping under test.

3.04 LOW PRESSURE AIR TEST (LPA)

A. Equipment: Equipment used to meet following minimum requirements.
   1. Pneumatic plugs to have a sealing length equal to or greater than diameter of pipe tested.
   2. Pneumatic plugs to resist internal test pressures without requiring external bracing or blocking.
   3. One of the pneumatic plugs to have inlet tap or other provision for connecting air supply to introduce low pressure air into the line for testing.
   4. All air used shall pass through a single control panel:
      a. From control panel to pneumatic plugs for inflation.
      b. From control panel to a sealed line for introducing low pressure air.
      c. From sealed line to control panel for continuous monitoring of air pressure in sealed line.
   5. Air supply system to have necessary valves and gauges to control rate at which air enters test section and for reading test results.
   6. Pressure gauges to have minimum graduations of 0.1 psi, an accuracy of plus or minus 0.04 psi, and a minimum dial diameter of 3½ inches.

B. Procedure
   1. Isolate test section by installing air-tight plugs. Plug ends of branches, laterals, and wyes which are to be included in test section. Brace all plugs to prevent slippage and blow-out.
   2. CONTRACTOR to carefully observe safety precautions during air testing to prevent injury to personnel from plugs blowing out. No one allowed in manholes during test.
   3. Inflate pneumatic plugs to 25 psig.
   4. Slowly introduce low pressure air into sealed line until pressure reaches test pressure plus 0.5 psig.
      a. Test pressure to be 3.5 psig.
      b. The maximum pressure allowed under any condition in air testing to be 10 psig. The maximum groundwater level for air testing is 13 feet above top of pipe.
   5. Allow a minimum of 2 minutes for temperature and pressure of the air to stabilize. Add air as required to maintain internal pressure specified plus or minus 0.5 psig.
   6. When internal air pressure has stabilized and is at or above test pressure, disconnect air supply and commence test. Utilizing a stopwatch, record period of time required for pressure to drop 1.0 psig from starting pressure. Following table lists minimum test times for various pipe sizes. If time for pressure to decrease 1.0 psig is less than value in table, then system has failed.

Pipe Size	Minimum Test Time	
	Minutes	Seconds
6″	2	50
8″	3	56
10″	4	43
12″	5	40
15″	7	5
18″	8	30
21″	9	55
24″	11	20
27″	12	45
30″	14	10
36″	17	0
42″	19	50
48″	22	36
54″	25	16
60″	27	47

For other sizes, consult with ENGINEER.

7. Test may be discontinued when prescribed minimum test time has been reached, even though 1.0 psig pressure drop has not occurred.
8. Release air from pipe slowly and remove plugs at conclusion of test.

3.05 HIGH PRESSURE AIR TESTING (HPA)

A. Purge line to be tested with water or high velocity air as appropriate to system being tested.

B. Unless otherwise specified, perform two-hour pressure test at 150 psig using dry, oil free air. Unless otherwise specified, no leaks will be allowed.

C. Test joints with soapy water solution for leaks.

3.06 EXFILTRATION TESTING (ET)

A. General: Take precautions required to prevent damage to lines and appurtenances being tested. Repair any damage resulting from test at CONTRACTOR's expense. Conduct test in presence of ENGINEER.

B. Preparation: Seal ends of section being tested with water-tight plugs. Fill section with water 24 hours prior to start of test. Vent line during filling so that no air is trapped in line. Leave outlets of stacks, inlets, and service lines exposed and unplugged until after exfiltration test has been made. Outlets terminating below level of test water surface to be temporarily extended upward by installing additional lengths of pipe or by plugging. After completion of satisfactory test, remove lengths of pipe added for test.

C. Duration of Test: Test for at least 2 hours with minimum head of 4 feet measured above top crown, inside pipe at upper end of section being tested.

D. Allowable Leakage: Allowable leakage or exfiltration in any individual section or entire sewer line under construction is defined in Paragraph 3.08. Remove and replace or make approved corrective repairs to any section or line which has leakage or exfiltration that exceeds above amount. Repair any individual leaks that may appear whether or not overall section meets leakage requirements. For this purpose, any steady stream will be considered a leak, while a drip will not. Individual leaks ordinarily will be revealed by looking through sewer with a light while groundwater level is over sewer, during backfill operations, or immediately after water from exfiltration tests is emptied from sewer line. Settlement in backfill during exfiltration tests will be taken and an indication of leakage.

E. Measurement of Leakage: Measure leakage or exfiltration during test period by adding measured quantities of water to maintain water level in test structure. Quantity of water added to maintain water level is amount of leakage or exfiltration.

F. Retest: Sewers failing to meet requirements of leakage test to be tested again for leakage after repair by CONTRACTOR. No sewer will be accepted until leakage is less than allowable.

3.07 INFILTRATION TESTING (IT) (NOT USED)

3.08 ALLOWABLE LEAKAGE FOR NONPRESSURE PIPELINES

The allowable leakage (exfiltration or infiltration) for non-pressure pipelines is not to exceed the following:

Type of Pipe	Leakage (gallons per 24 hours per inch of diameter per 1,000 feet of pipe)
Ductile iron - mechanical or push-on joints	10
Polyvinyl chloride, thermal plastic or fiberglass with solvent-cemented joints, or centrifugally cast fiberglass pipe and fittings	10
Concrete with rubber joints	20
Concrete with steel and rubber joints	10
Clay with rubber gasket joints	20
Cast iron soil pipe:	
1. Drains and Vents	0
2. Sewer Laterals	*
All piping inside structures	0

* The same allowable as pipe to which it is connected.

Regardless of the above allowable leakage, any visible leaks detected to be permanently stopped.

3.09 PIPELINE SETTLEMENT TESTING

A. TV Inspection

1. During infiltration test or after exfiltration test, pipe to be TV inspected for possible settlement. When air testing has been used, run water through pipe to permit meaningful observations. Any pipe settlement which causes ponding of water in pipe is an indication of system failure.

2. TV inspection required on all sanitary sewers greater than 30 inches in diameter and all sewers installed with curved alignment.

B. Mandrel Testing: All plastic piping materials used for gravity sewers to be subjected to a 95% mandrel test. Mandrel testing to be completed no sooner than four weeks after backfilling has been completed. A Go-No-Go deflection testing mandrel with a minimum of nine runners to be used for testing. Mandrel to be furnished with proving ring. Dimensions of the mandrel for SDR-26 PVC, to be as shown in Attachment "A" to this Section and as required by City of Austin, AWU SPL WW-227 or 227A. For other wall thicknesses, consult ENGINEER. Testing to be as follows:

1. Completely flush line and clean pipe of debris.
2. Install pull rope in section to be tested.
3. Attach pull rope and retrieval rope to mandrel.
4. Insert mandrel in pipe. Remove slack from pull rope and place tape marker on rope at end of pipe where mandrel will exit. Tape marker to be used to determine mandrel location in line.
5. Using guide pulleys, pull mandrel through line. Use tape marker to determine location of over-deflected sections.
6. All pipe sections failing to pass the mandrel to be removed and reinstalled.
7. Repeat testing until system passes.

3.10 LEAKAGE TESTING FOR PRESSURE PIPELINES

A. Leakage test to be conducted concurrently with hydrostatic pressure tests.

B. Leakage Defined: Leakage is defined as the quantity of water that must be supplied into pipe, or any valved section thereof, to maintain pressure within specified test pressure after air in pipeline has been expelled and pipe has been filled with water and brought to test pressure.

C. Determine rate of leakage at 15-minute intervals by means of volumetric measurement of makeup water added to maintain test pressure. The test to proceed until the rate of leakage has stabilized or is decreasing below an allowable value, for 3 consecutive 15-minute intervals. After this, test pressure to be maintained for at least another 15 minutes.

D. The allowable leakage for pressure pipelines including surcharged gravity lines not to exceed the following in gallons per 24 hours per inch of diameter per mile of pipe:

Type of Pipe	Leakage (gallons per 24 hours per inch of diameter per mile of pipe)
Ductile iron	10
Polyvinyl chloride, thermal plastic or fiberglass with rubber joints	10
Polyvinyl chloride, thermal plastic or fiberglass with solvent-cemented joints, or centrifugally cast fiberglass pipe and fittings	0
Concrete with steel and rubber joints	10
Steel with welded joints	0
Steel with harnessed joints	10
Wrought steel	0
Copper	0
All piping inside structures	0

Regardless of the above allowable leakage, any visible leaks detected to be permanently stopped.

3.11 TESTING OF PLUMBING SYSTEMS

A. Potable Water Lines: Hydrostatically test at 100 psig; maintain pressure for one hour; no leaks allowed.

B. Test vertical soil and waste vents as soon as set. Plug outlets, fill to top of vertical lines, and hold for 24 hours. Make final test after roughing in is complete and before connecting sewer.

C. Perform smoke test on drain, waste and vent (DWV) lines in accordance with the following:
   1. Perform smoke test on DWV lines after all fixtures have been permanently connected and all traps filled with water.
   2. Close all windows and doors in the building and turn HVAC system off for the duration of the smoke test.
   3. One or more smoke machines to be connected to main building clean out or other suitable connection. Smoke machines to produce a thick penetrating smoke. Smoke produced by chemical mixtures are not acceptable.
   4. Add smoke to the system until smoke is visible at vent stacks. Plug vent stacks and continue to add smoke until a pressure of 1-inch water column is produced. Maintain pressure for a minimum of 15 minutes.
   5. Visually inspect each connection and fixture for smoke. Any odor or sign of smoke is indication of system failure.
   6. Repair all leaks and retest.

3.12 SPECIAL TESTING PROCEDURES (NOT USED)

3.13 TESTING PROCEDURES AT INTERFACES WITH EXISTING PIPING OR BOUNDARIES

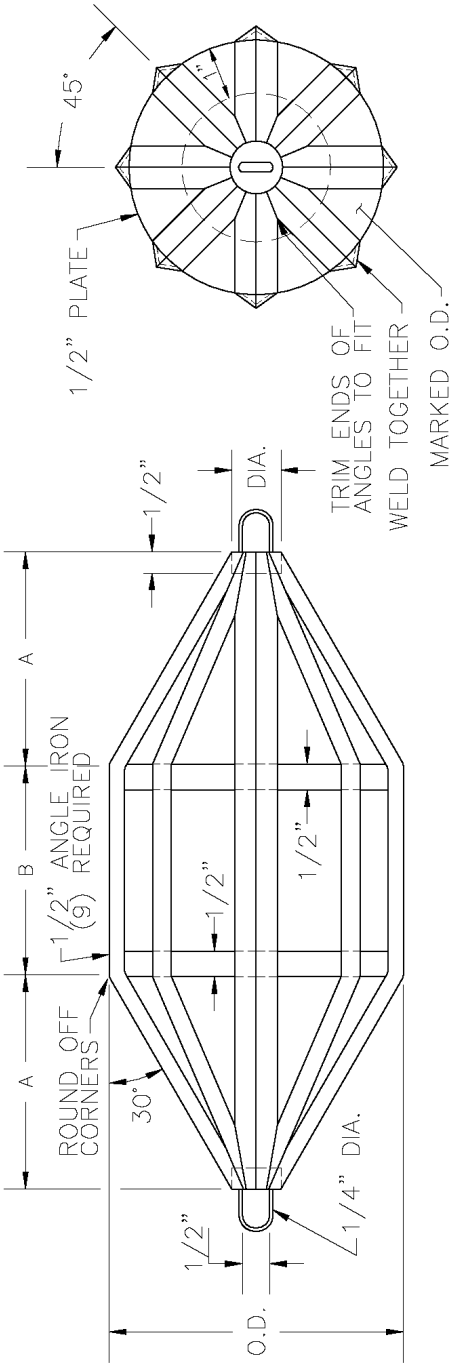
A. New Piping That Connects to Existing Piping
   1. Complete piping up to final closure between existing and new piping.
   2. Test new piping per applicable paragraph of this Specification by installing a closure piece to isolate the new section. Test pressure as specified or noted.
   3. Complete connection to existing piping. If underground, leave joint exposed.
   4. Test piping again, per applicable paragraph of this Specification, to verify the integrity of the completed joint.
      a. Isolate existing piping by installing test plugs or closing valves if they exist. Only isolate piping necessary to verify joint integrity. Test pressure at the interface between new and existing piping to be 110% of the maximum working pressure at the interface. Hold test pressure for one hour. If pressure test fails, maintain pressure at the joint by adding water to the system and visually inspect joint for leaks. If no leaks are visible at the interface, no further testing is required. If leaks are visible, repair and retest.
      b. Only when noted on PLANS or specified elsewhere, place piping in service and visually inspect joint(s). If no leaks are visible at the interface after pressurizing to the maximum working pressure, no further testing is required. If leaks are visible, repair and retest.
   5. Coordination with plant operations is required for removing line from service, closing valves and shutdowns.

B. Pipe Testing at the Boundary Between Two Construction Contracts
   1. “Installed” piping at the boundary between two construction Contracts is defined as piping that has been installed and tested per Contract Requirements and approved by the ENGINEER.

2. If Connecting Pipe Has Not Been Installed:
    a. Install closure piece (i.e. plug, blind flange, etc.) at the boundary and test per applicable paragraph of this Specification. Test pressure to be as specified.
3. If Pipe at Boundary Is Installed:
    a. Complete piping up to final closure at the boundary.
    b. Test new piping per applicable paragraph of this Specification by installing a closure piece to isolate the new section. Test pressure as specified.
    c. Complete connection at boundary. If underground, leave joint exposed.
    d. Retest piping. Test pressure to be 100% of the maximum working pressure at the boundary. If there are no visible leaks at the interface, then no further testing is required. If leaks are visible at the interface, repair and retest.

3.14 MEASUREMENT AND PAYMENT

No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.



SIDE or TOP VIEW

PIPE SIZE (IN.)	A (IN.)	B (IN.)	MANDREL O.D. PVC (SDR-26) ASTM D3034 (IN.)	DIA. (IN.)
6	4.0	4	5.50	1.00
8	5.3	6	7.37	1.40
10	6.7	6	8.64	1.67
12	8.0	8	10.96	1.95
15	10.0	9	13.42	2.15

END VIEW

PIPE SIZE (IN.)	A (IN.)	B (IN.)	MANDREL O.D. PVC (SDR-26) ASTM F679 (IN.)	DIA. (IN.)
18	12	12	16.49	2.89
21	14	14	19.44	3.57
24	16	16	21.87	3.73
27	18	18	23.51	4.25

DEFLECTION TESTING MANDREL

SCALE:

ATTACHMENT "B"

Service	Size	Required Tests	Test Pressure	Duration	Remarks
Gravity					
A. Storm Sewer	All	Visual	None	N/A	
B. Sanitary Sewer	All	(Exfiltration or Infiltration or Low Pressure Air) + TV + Mandrel	See Text	See Text	
C. Surcharged	All	Hydrostatic	150% of system pressure	2 Hrs. (min.)	
Above Ground					
A. Pump Suction	All	Hydrostatic & Leakage	150% of max. wet well level (25 psi min.)	1 Hr. (min.)	No leaks allowed
B. Pump Discharge	All	Hydrostatic & Leakage	150% of pump shut-off head (100 psi min.)	2 Hrs. (min.)	
C. All Others	All	Hydrostatic & Leakage	150% of system pressure (100 psi min.)	2 Hrs. (min.)	
Underground Pressure Piping	All	Hydrostatic & Leakage	Waterlines: 150 psi Pump discharge: 150% of pump shut-off head (100 psi min.)	2 Hrs. (min.)	
Plumbing (Inside Building)					
A. DWV	All	Low pressure air or hydrostatic smoke	5 psi See Text	24 Hrs. See Text	No leaks allowed
B. Waterlines	All		100 psi	See Text	No leaks allowed
Tank & Fill Drain	All	Hydrostatic & Leakage	150% of tank head	2 Hrs. (min.)	No leaks allowed
Open-Ended Piping	Up to 48″	Hydrostatic & Leakage	25 psi If >48″, consult ENGINEER	1 Hr. (min.)	
Gas Piping					
A. Low Pressure Air	Up to 2″ >2″	High Pressure Air Hydrostatic	25 psi	2 Hrs. (min.)	No leaks allowed
B. High Pressure Air	Up to 2″ >2″	High Pressure Air Hydrostatic	150% of system pressure (150 psi min.)	24 Hrs.	
C. Vacuum	All	High Pressure Air	25 psi	2 Hrs. (min.)	No leaks allowed
D. All Others	Up to 2″ >2″	High Pressure Air Hydrostatic	See Text	See Text	No leaks allowed

END OF SECTION

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SECTION 05010

METALS FOR STRUCTURES

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the furnishing and fabrication of various metals for various types of structures shown on PLANS.

1.02 RELATED REQUIREMENTS

A. Related work as called for on PLANS or specified in this or other TECHNICAL SPECIFICATION sections.

1.03 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A27/A27M	Standard Specifications for Steel Bars, Carbon and Alloy, Hot-Wrought and Cold-Finished
ASTM A36/A36M	Standard Specification for Structural Steel
ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A167	Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
ASTM A193/A193M	Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A307	Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A325	Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A384	Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing or Steel Assemblies
ASTM A525	Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A992 / A992M-00	Standard Specification for Steel for Structural Shapes for use in Building Framing
ASTM B29	Standard Specification for Refined Lead

ASTM B133/B133M	Standard Specification for Copper Rod, Bar, and Shapes
ASTM B152/B152M	Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar
ASTM B221	Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
ASTM B308/B308M	Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Shapes

1.04 - 1.11 (NOT USED)

PART 2 PRODUCTS

2.01 MANUFACTURER(S) (NOT USED)

2.02 MATERIALS AND/OR EQUIPMENT

A. Structural Steel:
   1. Rolled Wide Flange Shapes: Per ASTM A992/A992M.
   2. All other Rolled Shapes: Per ASTM A36/A36M, unless otherwise noted.

B. Carbon Steel Castings: Per ASTM A27/A27M, Grade 60-30M (Minimum).

C. Galvanized Sheet Metal: Per ASTM A525, for zinc-coated (galvanized) iron or steel sheets.

D. Threaded Fasteners
   1. Standard Bolts: Per ASTM A307.
   2. High-Strength Bolts: Per ASTM A325.

E. Corrosion-Resisting (Stainless) Steel
   1. Plate, Sheet, Strip, Fasteners Where No Welding Required: Per ASTM A167, Type 316 unless noted otherwise.
   2. Plate, Sheet, Strip, Fasteners Where Welding Required: Per ASTM A167, Type 316L or unless noted otherwise.
   3. Bolts: Type 316 conforming to ASTM A193 with suitable stainless steel nuts and washers.

F. Copper
   1. Sheet, Strip, Plate: Per ASTM B152/B152M, No. 110.
   2. Rod, Bar, Shapes: Per ASTM B133/B133M, No. 110.

G. Lead: Pig lead per ASTM B29.

H. Aluminum
   1. Structural Shapes, Extrusions, Bars, Grating, Stair Treads: Per ASTM B221 and ASTM B308/B308M, Alloy 6061-T6.
   2. Gravel Stops: Per ASTM B221, Alloy 6063-T42.
   3. Other Items: Per recognized standards.

I. Galvanizing: Per ASTM A123, ASTM A153, and ASTM A384 as applicable.

2.03 - 2.04 (NOT USED)

PART 3 EXECUTION

3.01 - 3.10 (NOT USED)

3.11 MEASUREMENT AND PAYMENT

No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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SECTION 05015

STAINLESS STEEL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Scope: Applies to all stainless steel fabrications as shown on the PLANS. Furnish all plant, labor, supervision, materials, equipment, supplies, tools, and all operations in connection with furnishing, installing, and placing in service stainless steel fabrications.

1.02 RELATED REQUIREMENTS

Other related work as called for on PLANS or specified elsewhere in this or other Technical Specification Sections.

1.03 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B18.2.1	Square and Hex Bolts and Screws Inch Series

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME Section IX	Boiler and Pressure Vessel Code - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators

AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

ASTM A167	Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A193	Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A240	Standard Specification for Heat Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
ASTM A276	Standard Specification for Stainless Steel Bars and Shapes
ASTM A380	Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems
ASTM A967	Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts

1.04 - 1.05 (NOT USED)

1.06 SUBMITTALS

A. Furnish large-scale, dimensioned shop drawings showing plan, elevation, and appropriate cross sections. Show piece marks, sizes, drilling, thickness, joint details, and materials. Furnish chemical and physical material certificates for each heat used during manufacture.

B. Submit welder qualification certificates.

C. Submit shop testing certificates.

D. Submit pickling and passivation procedures and material descriptions.

1.07 QUALITY ASSURANCE

A. Fabrication dimensions and accuracy of fabrication are Contractor's responsibility.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Shipping
   1. Ship factory fabricated assemblies in the largest sections permitted by carrier regulations, properly match-marked for ease of field erection.
   2. Loose parts (nuts and bolts, etc.) are to be shipped in crates that are clearly marked as to contents.

B. Handling and Unloading
   1. Unload and handle equipment in accordance with fabricator's instructions.
   2. Transfer of unprotected stainless steel to be accomplished utilizing nylon straps or stainless steel cables to avoid contact with carbon steel components.

C. Storage
   1. Store in an area that will avoid damage due to traffic.
   2. Exposure to normal weather conditions is acceptable; however, avoid contact with other materials like carbon steel, aluminum, concrete, and corrosive chemicals.

1.09 - 1.11 (NOT USED)

PART 2 PRODUCTS

2.01 MANUFACTURER(S): Use materials of domestic manufacture.

2.02 MATERIALS AND/OR EQUIPMENT

A. General: Materials used in manufacture to be 316L stainless steel unless specifically noted otherwise.

B. Minimum Material Requirements
   1. Stainless Steel Bars and Shapes: ASTM A276
   2. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666, ASTM A240, or ASTM A167
   3. Stainless Steel Bolts and Nuts: ASTM 193

2.03 FABRICATION

A. General:
   1. All fabrication to be performed in a fully equipped fabrication shop.
   2. Each piece to be marked with an identification mark that corresponds to the shop drawing to facilitate job site assembly.

B. Welding
   1. All welding is to be qualified and certified in accordance with the requirements of the latest edition of ANSI/AWS D1.1 “Structural Welding Code – Steel” published by the American Welding Society.
   2. Fabricate utilizing inert argon gas, shielded arc plasma, MIG or TIG welding procedures.
   3. Add filler wire to all welds to provide a cross sectional area of weld and metal thickness equal to or greater than the parent metal. Filler wire to be at least one grade higher than the parent metal and of the extra low carbon grade.
   4. Rigid jigs and fixtures are to be utilized for holding parts together in proper alignment while welding.
   5. All joints are to be accurately fitted, aligned, and cleaned of foreign material prior to welding.
   6. Grind flush all welds on gasketed surfaces.

C. Pickle and passivate all welded stainless steel fabrications by using the following procedure.
   1. Wire-brush all outside weld area to remove weld splatter. Brushes are to be stainless steel and are to have been used only on stainless steel.
   2. Remove all carbon deposits, greases, and oils by pickling and neutralization to aid the regeneration of a uniform corrosion-resistant chromium oxide film.
      a. After welding and brushing the weld clean, completely immerse all stainless steel assemblies and parts in a pickling solution of 6% nitric acid and 3% hydrofluoric acid at a temperature of 140 F for a minimum of 15 minutes or until a mild etch is achieved. In lieu of passivation, a glass bead blast will be acceptable.
      b. Neutralize the pickling solution after cleaning by immersing the assemblies and parts into a solution of tri-sodium phosphate and then rinsing with clean water.

2.04 SOURCE QUALITY CONTROL

A. Nuts and Bolts: Per ANSI B 18.2, stainless steel, type and grade to prevent galling.

PART 3 EXECUTION

3.01 - 3.02 (NOT USED)

3.03 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

A. General Requirements
   1. PLANS show sizes, elevations, and general arrangement.

3.04 - 3.10 (NOT USED)

3.11 MEASUREMENT AND PAYMENT

No separate measurement and payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

1.01 SUMMARY

A. This Section defines the furnishing, fabrication, and installation of various metals for various types of structures and support purposes. The Section includes:
   1. Structural steel shapes and plate.
   2. Fasteners:
      a. All thread rods.
      b. Anchor bolts.
      c. Assembly bolts.
      d. Chemical anchors.
      e. Concrete anchors.
      f. Concrete inserts.
      g. Deformed bar anchors.
      h. Eyebolts.
      i. Flush shells.
      j. High strength all thread rods.
      k. High strength bolts.
      l. Powder actuated fasteners.
      m. Sleeve anchors.
      n. Undercut or similar concrete anchors.
      o. Welded studs.
   3. Isolation sleeves and washers.
   4. Thread coating.
   5. Welding.

1.02 RELATED REQUIREMENTS

A. Other related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATION Sections.

1.03 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referenced to in the text by basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC	Specification for Structural Steel Buildings

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B212-15	Cutting Tools - Carbide-tipped Masonry Drills and Blanks for Carbide-tipped Masonry Drills

AMERICAN WELDING SOCIETY (AWS)

AWS A5.1	Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding

AWS A5.17	Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding
AWS A5.20	Specification for Carbon Steel Electrodes for Flux Cored Arc Welding
AWS D1.1	Structural Welding Code – Steel
AWS D10.4	Recommended Practices for Welding Austenitic Chromium-Nickel Stainless Steel Piping and Tubing

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 29	Standard Specification for Steel Bars, Carbon and Alloy, Hot-Wrought, General Requirements for
ASTM A 36 / A 36M	Standard Specification for Carbon Structural Steel
ASTM A 53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded, and Seamless
ASTM A 108	Standard Specification for Steel Bars, Carbon, Cold Finished
ASTM A 123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153 / A 153M	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 193	Standard Specification for Alloy Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A 240	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM A 276	Standard Specification for Stainless Steel Bars and Shapes
ASTM A 307	Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A 325	Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 489	Standard Specification for Carbon Steel Lifting Eyes
ASTM A 490	Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
ASTM A 496	Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement
ASTM A 500	Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

ASTM A 501	Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A 992 / A 992M	Standard Specification for Structural Steel Shapes
ASTM F 593	Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
ASTM F 959	Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners

INTERNATIONAL CODE COUNCIL (ICC)

INTERNATIONAL BUILDING CODE (IBC)

IBC AC 01	Acceptance Criteria for Expansion Anchors in Masonry Elements
IBC AC 58	Acceptance Criteria for Adhesive Anchors in Masonry Elements
IBC AC 193	Acceptance Criteria for Mechanical Anchors in Concrete Elements
IBC AC 308	Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements

1.04 – 1.05 (NOT USED)

1.06 SUBMITTALS

A. Furnish the following in accordance with Specification Section 01300, “Submittals”.
   1. Product data
      a. Post-installed anchors for use in concrete and masonry.
         (1) Manufacturer’s data including catalog cuts showing materials of construction, finishes, and details of installation for each anchor type.
   2. Quality control submittals
      a. Submit shop drawings of members to be fabricated before starting their fabrication.
      b. Welder’s certificates.
      c. Submit steel fabricator's certification.
   3. Test reports
      a. Certified copies of mill tests and analyses made in accordance with applicable ASTM standards, or reports from a recognized commercial laboratory, including chemical and tensile properties of each shipment of structural steel or part thereof having common properties.
      b. Current International Code Council Evaluation Service (ICC-ES) Report for each type of post-installed anchors to be used.
      c. Concrete anchor installation test report.

1.07 QUALITY ASSURANCE

A. Qualifications:
   1. Perform welding of structural metals with welders who have current AWS certificate for the type of welding to be performed.
   2. Steel fabricators shall be certified by the AISC or other certification as recognized and accepted by the local building official having jurisdiction.
   3. Notify ENGINEER 24 hours minimum before starting shop or field welding.

4. ENGINEER may check materials, equipment, and qualifications of welders.
5. Remove welders performing unsatisfactory Work, or require to requalify.
6. ENGINEER may use gamma ray, magnetic particle, dye penetrant, trepanning, or other aids to visual inspection to examine any part of welds or all welds.
7. CONTRACTOR shall bear costs of retests on defective welds.
8. CONTRACTOR shall also bear costs in connection with qualifying welders.

B. Certification:
1. Steel fabricators shall be certified by the AISC or other certification acceptable to the local building official having jurisdiction.

C. Concrete anchor installation test:
1. Prior to installation or use of concrete anchors, perform the following test:
a. Furnish not less than four of each type proposed for use, and install anchors in a test block of concrete to specified embedment length.
b. Furnish and install one 5/8-inch nut on each concrete anchor and tighten each with an applied torque of 10 foot-pounds.
c. Loosen each nut and then retighten with an applied torque load of 10 foot-pounds.
d. Visible evidence of turning by a concrete anchor will be cause for ENGINEER to reject concrete anchors.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Packing and shipping: Deliver structural steel free from mill scale, rust, and pitting.

B. Storage and protection: Until erection and painting, protect from weather items not galvanized or protected by a shop coat of paint.

1.09 – 1.11 (NOT USED)

PART 2 PRODUCTS

2.01 MANUFACTURERS (NOT USED)

2.02 MATERIALS AND/OR EQUIPMENT

A. Unless otherwise specified or Indicated on the Drawings, materials shall conform to the following:

Item	ASTM Standard	Class, Grade, Type, or Alloy Number
Steel		
Plate, bars, rolled shapes (except W and WT shapes), and miscellaneous items	A 36 / A 36M	--
Rolled W and WT shapes	A 992 / A 992M	Grade 50
Hollow structural sections (HSS): Round, square, or rectangular	A 500	Grade B
Tubing, hot-formed	A 501	--
Round HSS	A 500	Grade B
Steel pipe	A 53	Grade B
Stainless steel		

Item	ASTM Standard	Class, Grade, Type, or Alloy Number
Plate, sheet, and strip	A 240	Type 304* or 316**
Bars and shapes	A 276	Type 304* or 316**
* Use Type 304L if material will be welded. ** Use Type 316L if material will be welded.		

B. Where stainless steel is welded, use low-carbon stainless steel.

C. General: Furnish threaded fasteners, except high strength bolts, with flat washers, and self-locking nuts, or lock washers and nuts.
   1. Bolt heads and nuts: Hex-type.
   2. Bolts, nuts, and washers: Of domestic manufacture.
   3. Where bolts, including anchor bolts, nuts, washers, and similar fasteners are specified to be galvanized, galvanize in accordance with ASTM A 153 / A 153M.

D. All thread rods:
   1. Type 316 Stainless Steel in accordance with ASTM F 593 for use in wet and moist locations, including:
      a. Water-containing structures:
         (1) Below and at water level.
         (2) Above water level:
            (a) Below top of walls of water-containing structures.
            (b) Under the roof, slab, beam, or walkway of enclosed water-containing structures.
         (3) Dry side of walls of water-containing structures.
      b. Pump bases.
   2. Type 304 or Type 316 stainless steel in accordance with ASTM F 593 for aluminum assemblies.
   3. ASTM A 36 / A 36M meeting the mechanical requirements of ASTM A 307. Hot-dip galvanize for galvanized assemblies and for applications other than those specified.

E. All thread rods bonded in holes drilled in concrete with epoxy: As specified in Paragraph 2.02.A and as indicated on the PLANS.

F. Anchor bolts:
   1. Anchor bolts, nuts, and washers: Type 316 stainless steel in accordance with ASTM F 593 for use in wet and moist locations, including:
      a. Water-containing structures:
         (1) Below and at water level.
         (2) Above water level:
            (a) Below top of walls of water-containing structures.
            (b) Under the roof, slab, beam, or walkway of enclosed water-containing structures.
         (3) Dry side of walls of water-containing structures.
      b. Pump bases.
   2. Anchor bolts, nuts, and washers: Type 304 or Type 316 stainless steel for fastening aluminum to concrete or steel.
   3. Anchor bolts, nuts, and washers: Hot-dip galvanized ASTM A 307 steel bolt or hot-dip galvanized ASTM A 36 / A 36M steel, for applications other than those specified.

G. Assembly bolts:
1. Bolts, nuts, and washers for wood baffles, collectors, and other field-assembled construction: Type 316 stainless steel in accordance with ASTM F 593 for use in wet and moist locations, including:
    a. Water-containing structures:
        (1) Below and at water level.
        (2) Above water level:
            (a) Below top of walls of water-containing structures.
            (b) Under the roof, slab, beam, or walkway of enclosed water-containing structures.
            (c) Dry side of walls of water-containing structures.
    b. Pump bases.
2. Type 304 or Type 316 stainless steel in accordance with ASTM F 593 for aluminum assemblies.
3. Hot-dip galvanized ASTM A 307 steel for galvanized assemblies and for applications other than those specified.

H. Chemical anchors:
1. All-thread rods shall be either ASTM A 36 / A 36M steel or stainless steel.
2. Hot-dip galvanize or zinc plate ASTM A 36 / A 36M steel all-thread rods.
3. Stainless steel all-thread rod shall conform with ASTM F 593 and shall be used for corrosive conditions where indicated on the PLANS.
4. All-thread rods used with the adhesive capsule shall have chisel points and shall be free of oil or coatings that may reduce bond.
5. Do not use chemical anchors to resist tension in overhead positions.
6. Chemical anchors for anchorage to concrete:
    a. Chemical anchors shall have current ICC Evaluation Service Report that demonstrates compliance with ICC AC 308 for cracked concrete.
    b. Manufacturers: One of the following or approved equal:
        (1) Simpson SET-XP (ICC ESR-250B)
7. Chemical anchors for anchorage to masonry (solid or solid grouted):
    a. Chemical anchors shall have current ICC Evaluation Service Report that demonstrates compliance with ICC AC 58.
    b. Manufacturers: One of the following or approved equal:
        (1) Simpson SET (ICC ESR-1772)

I. Concrete mechanical and screw anchors:
1. Expansion and screw anchors anchorage to concrete:
    a. Concrete anchors shall have current ICC Evaluation Service Report that demonstrates compliance with ICC AC 193 for cracked concrete.
    b. Manufacturers: One of the following or approved equal:
        (1) Simpson STRONG-BOLT (ICC ESR-1771) or TITEN HD (ICC ESR-2713)
        (2) Hilti KWIK-BOLT TZ (ICC ESR-1971)
2. Expansion and screw anchors anchorage to masonry:
    a. Concrete anchors shall have current ICC Evaluation Service Report that demonstrates compliance with ICC AC 01.
    b. Manufacturers: One of the following or approved equal:
        (1) Simpson WEDGE-ALL (ICC ESR-1396) or TITEN HD (ICC ESR-1056)
3. Concrete anchor's integral threaded stud, wedge, washer, and nut: Type 304 or Type 316 stainless steel in accordance with ASTM F 593. For use in wet and moist locations, including:
    a. Water-containing structures:
        (1) Below and at water level.

(2) Above water level:
(a) Below top of walls of water-containing structures.
(b) Under the roof, slab, beam, or walkway of enclosed water-containing structures.
(3) Dry side of walls of water-containing structures.
b. Pump bases.
4. Concrete anchor's integral threaded stud, wedge, washer, and nut: Type 304 or 316 stainless steel in accordance with ASTM F 593 for fastening aluminum to concrete or steel.
5. Concrete anchor's integral threaded stud, wedge, washer, and nut: Hot-dip galvanized carbon steel, for applications other than those specified.
6. Do not use slug-in, lead cinch, and similar systems relying on deformation of lead alloy or similar materials in order to develop holding power.

J. Concrete inserts: 1 piece, hot-dip galvanized, integrally hot forged unit fabricated from steel meeting ASTM A 29 Hot Rolled Grade 1045 requirement. Manufacturers: One of the following or approved equal:
1. Dayton Superior, F-54 Ductile Embedded Insert.

K. Deformed bar anchors: In accordance with ASTM A 496:
1. Manufacturers: One of the following or approved equal:
a. Nelson Stud Welding Company, D2L Deformed Bar Anchors.
b. Stud Welding Products, DBA (Deformed Bar) Anchors.

L. Eyebolts:
1. Welded or forged, when manufactured of materials other than carbon steel.
2. Having geometric and strength characteristics of eyebolts specified in ASTM A 489, Type 1. The strength characteristics include proof load requirements, breaking strength requirements, tensile strength requirements, bend test, and impact strength.

M. Flush shells:
1. Manufacturers: One of the following or approved equal:
a. ITW Red Head, Multi-Set II Drop-In.
b. Hilti Incorporated, HDI Drop-In.
2. Bolts, flush shells, threaded rods, washers, and nuts: Type 303 stainless steel in accordance with ASTM F 593.

N. High strength all thread rods: In accordance with ASTM A 193, Grade B7, hot-dip galvanized.

O. High strength bolts: High strength bolts, nuts, and hardened flat washers shall be in accordance with ASTM A 325 or ASTM A 490, as indicated on the PLANS.

P. Powder actuated fasteners:
1. For installation in concrete or steel: Zinc coated, heat-treated, alloy steel.
2. Fasteners not sufficiently protected against corrosion from exposure to corrosive conditions: Coat as necessary to make suitable for such conditions.
3. Pins: Furnish with head or threaded stud capable of transmitting loads to shank.
4. Pins connected to steel: Furnish with longitudinal serrations around circumference of shank.

Q. Sleeve anchors:
1. Sleeve anchors for anchorage to concrete:
a. Sleeve anchors shall have current ICC Evaluation Service Report that demonstrates compliance with ICC AC 193 for cracked concrete.

b. Manufacturers: One of the following or approved equal:
(1) Hilti HSL-3 (ICC ESR-1545)

2. Sleeve anchors for anchorage to masonry:
a. Sleeve anchors shall have current ICC Evaluation Service Report that demonstrates compliance with ICC AC 01.
b. Manufacturers: One of the following or approved equal:
(1) Simpson SLEEVE-ALL

3. Use stainless material for aluminum and stainless attachments and carbon steel for steel attachments.

4. For use in wet and moist locations, including locations listed below. Use Type 304 stainless steel in accordance with ASTM F 593 for sleeve anchor's internal bolt, expansion sleeve, extension sleeve, and washer. Use Type 303 stainless steel in accordance with ASTM F 593 for sleeve anchors expansion cone.
a. Water-containing structures:
(1) Below and at water level.
(2) Above water level:
(a) Below top of walls of water-containing structures.
(b) Under the roof, slab, beam, or walkway of enclosed water-containing structures.
(3) Dry side of walls of water-containing structures.
b. Pump bases.

5. For fastening aluminum to concrete or steel, use Type 304 stainless steel in accordance with ASTM F 593 for sleeve anchor's internal bolt, expansion sleeve, extension sleeve. Use Type 303 stainless steel in accordance with ASTM F 593 for sleeve anchor's expansion cone.

6. For applications other than those specified above, use hot-dip galvanized carbon steel for sleeve anchor's internal bolt, expansion sleeve, expansion cone, extension sleeve, and washer.

7. The sleeve anchor shall have a nylon compression ring which compresses to ensure that the material being fastened is tightly secured against the concrete.

8. Do not use slug-in, lead cinch, and similar systems relying on deformation of lead alloy or similar materials in order to develop holding power.

R. Undercut concrete anchors:
1. Materials: In accordance with ASTM A 193, Grade B7. hot-dip galvanized.
2. Manufacturers: One of the following or approved equal:
a. Simpson TORQ-CUT anchors
b. Hilti HDA Undercut anchors

S. Welded studs:
1. ASTM A 108 with 50,000-pounds per square inch minimum yield strength, and 60,000-pounds per square inch minimum tensile strength.
2. Headed studs: Manufacturers: One of the following or approved equal:
a. Nelson Stud Welding Company, S3L Shear Connectors or H4L Concrete Anchors.
b. Stud Welding Products, Headed Concrete Anchors or Shear Connectors.

T. Isolating Sleeves and Washers:
1. Manufacturers: One of the following or approved equal:
a. Central Plastics Company, Shawnee, Oklahoma.
b. Corrosion Control Products, PSI Inc., Gardena, CA.
2. Sleeves: Mylar, 1/32 inch thick, 4,000 volts per mil dielectric strength, of proper size to fit bolts and extending half way into both steel washers.
a. 1 sleeve required for each bolt.

3. Washers: The inside diameter of all washer shall fit over the isolating sleeve and both the steel and isolating washers shall have the same inside diameter and outside diameter.
    a. Proper size to fit bolts. Two insulating washers are required for each bolt.
    b. Two 1/8-inch thick steel washers for each bolt.
4. G3 Phenolic:
    a. Thickness: 1/8 inch.
    b. Base material: Glass.
    c. Resin: Phenolic.
    d. Water absorption: 2 percent.
    e. Hardness (Rockwell): 100.
    f. Dielectric strength: 450 volts per mil.
    g. Compression strength: 50,000 pounds per square inch.
    h. Tensile strength: 20,000 pounds per square inch.
    i. Maximum operating temperature: 350 degrees Fahrenheit.

U. Galvanizing Surface Repair: Manufacturers: One of the following or approved equal:
1. Galvinox.
2. Galvo-Weld.

V. Thread Coating: Manufacturers: One of the following or approved equal:
1. Never Seez Compound Corporation, Never-Seez.
2. Oil Research, Inc., WLR No. 111.

W. Supplementary Parts: Furnish as required for complete structural steel erection, whether or not such parts and Work are specified or indicated on the PLANS.

2.03 FABRICATION

A. Shop assembly:
1. Fabricate structural steel in conformance with AISC "Specification for the Structural Steel Buildings - Allowable Stress Design and Plastic Design," unless otherwise specified or modified by applicable regulatory requirements.
2. Where anchors, connections, or other details of structural steel are not specifically indicated on the PLANS or specified, their material, size and form shall be equivalent in quality and workmanship to items specified.
3. For Structural members such as W shapes, S shapes, channels, angles, and similar members not available in quantity, size, and type of stainless steel specified or indicated on the PLANS.
    a. Fabricate by welding together pieces of low carbon stainless steel plate, such as Type 316L.
    b. Make full penetration welds between pieces of plate to attain same or higher section modulus and moment of inertia as members indicated on the PLANS.
4. Where galvanizing is required, hot-dip galvanize structural steel after fabrication in accordance with ASTM A 123:
    a. Do not electro-galvanize or mechanically-galvanize unless specified or accepted by ENGINEER.
    b. Restraighten galvanized items that bend or twist during galvanizing.
5. Round off sharp and hazardous projections and grind smooth.
6. Take measurements necessary to properly fit work in the field. Take responsibility for and be governed by the measurements and proper working out of all the details.
7. Take responsibility for correct fitting of all metal work.

2.04 SOURCE QUALITY CONTROL (NOT USED)

PART 3 EXECUTION

3.01 GENERAL (NOT USED)

3.02 PREPARATION

A. Verification of conditions: Examine Work in place to verify that it is satisfactory to receive the Work of this Section. If unsatisfactory conditions exist, do not begin this Work until such conditions have been corrected.

3.03 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

A. General:
   1 Fabricate structural and foundry items to true dimensions without warp or twist.
   2. Form welded closures neatly, and grind off smooth where weld material interferes with fit or is unsightly.
   3. Install structural items accurately and securely, true to level, plumb, in correct alignment and grade, with all parts bearing or fitting structure or equipment for which intended.
   4. Do not cock out of alignment, redrill, reshape, or force fit fabricated items.
   5. Place anchor bolts or other anchoring devices accurately and make surfaces that bear against structural items smooth and level.
   6. Rigidly support and brace structural items needing special alignment to preserve straight, level, even, and smooth lines. Keep structural items braced until concrete, grout, or dry pack mortar has hardened for 48 hours minimum.
   7. Erect structural steel in conformance with AISC "Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design," unless otherwise specified or modified by applicable regulatory requirements.
   8. Where anchors, connections, and other details of structural steel erection are not specifically indicated on the Drawings or specified, form, locate, and attach with equivalent in quality and workmanship to items specified.
   9. Round off sharp or hazardous projections and grind smooth.
   10. Paint or coat steel items as specified in Section 09902.

B. Welding - General:
   1. Make welds full penetration type, unless otherwise indicated on the PLANS.
   2. Remove backing bars and weld tabs after completion of weld. Repair defective welds observed after removal of backing bars and weld tabs.

C. Welding stainless steel:
   1. General: Comply with AWS D1.1.
      a. Perform with electrodes and techniques in accordance with AWS D10.4.

D. Welding carbon steel:
   1. General: Comply with AWS D1.1:
      a. Weld ASTM A 36 / A 36M and A 992 / A 992M structural steel, ASTM A 500 and A 501 structural tubing, and ASTM A 53 pipe with electrodes conforming to AWS A5.1, using E70XX electrodes; AWS A5.17, using F7X-EXXX electrodes; or AWS A5.20, using E7XT-X electrodes:
         (1) Field repair cut or otherwise damaged galvanized surfaces to equivalent original condition using a galvanized surface repair.

E. Interface with other products:
1. Where steel fasteners come in contact with aluminum or other dissimilar metals, bolt with stainless steel bolts and separate or isolate from dissimilar metals with isolating sleeves and washers.
a. Prior to installing nuts, coat threads of stainless steel fasteners with thread coating to prevent galling of threads.

F. Fasteners:
1. General:
a. Install bolts, including anchor bolts and concrete anchors, to project 2 threads minimum, but 1/2 inch maximum beyond nut.
b. Unless otherwise specified, tighten bolts, including anchor bolts and concrete anchors, to the "snug-tight" condition, defined as tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench.
2. All thread rods bonded in drilled holes in concrete with epoxy: As specified in Contract and as indicated on the PLANS.
3. Anchor bolts:
a. Cast-in-place when concrete is placed.
b. Accurately locate anchor bolts embedded in concrete with bolts perpendicular to surface from which they project.
c. Do not allow anchor bolts to touch reinforcing steel.
d. Where anchor bolts are within 1/4 inch of reinforcing steel, isolate with a minimum of 4 wraps of 10-mil polyvinyl chloride tape in area adjacent to reinforcing steel.
e. In anchoring machinery bases subject to heavy vibration, use 2 nuts, with 1 serving as a locknut.
f. Where bolts are indicated on the PLANS for future use, first coat thoroughly with nonoxidizing wax, then turn nuts down full depth of thread and neatly wrap exposed thread with waterproof polyvinyl tape.
g. Furnish anchor bolts with standard hex bolt head or an equivalent head acceptable to ENGINEER unless otherwise indicated on the PLANS. “L” or “J” anchor bolts are not equivalent to an anchor bolt with a hex bolt head.
h. Minimum anchor bolt embedment: 10-bolt diameters, unless longer embedment is indicated on the PLANS.
I. Where indicated on the PLANS, set anchor bolts in metal sleeves having inside diameter approximately 2 inches greater than bolt diameter and minimum 10-bolt diameters long. Fill sleeves with grout when a machine or other equipment is grouted in place.
j. Anchor bolts may be cast in concrete in lieu of using concrete anchors.
4. Chemical anchors:
a. Install anchors in accordance with approved ICC Evaluation Service Report. Where conflict exists between the approved ICC Evaluation Service Report and the requirements herein, the requirements of the Evaluation Service Report shall control.
b. Accurately locate concrete anchors and set perpendicular to surfaces from which they project.
c. Drilling holes:
(1) Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in the existing concrete without acceptance by ENGINEER.
(2) Determine location of reinforcing bars, or other obstructions with a non-destructive indicator device.
d. Hole drilling equipment:
(1) Electric or pneumatic rotary type with light or medium impact.

(2) Drill bits: Carbide-tipped in accordance with ANSI B212-15.
(3) Hollow drills with flushing air systems are preferred. Air shall be free of oil, water, or other contaminants which will reduce bond.
(4) Where edge distances are less than 2 inches, use lighter impact equipment to prevent microcracking and concrete spalling during drilling process.

e. Hole diameter:
(1) As recommended by chemical anchor cartridge manufacturer.

f. Install all thread rods to depth, spacings, and locations as indicated on the PLANS.

g. Cleaning holes:
(1) Insert long air nozzle into hole and blow out loose dust. Use air which is free of oil, water, or other contaminants which will reduce bond.
(2) Use a stiff bristle brush to vigorously brush hole to dislodge compacted drilling dust.
(3) Repeat step 1.
(4) Repeat above steps as required to remove drilling dust or other material which will reduce bond. The hole shall be clean and dry.

h. Cleaning all thread rods:
(1) Degrease over embedment length. The all thread rods shall be free of oil, grease, paint, dirt, mill scale, rust, or other coatings that will reduce bond.

5. Concrete anchors:

a. Do not use concrete anchors in lieu of anchor bolts.

b. Install anchors in accordance with approved ICC Evaluation Service Report. Where conflict exists between the approved ICC Evaluation Service Report and the requirements herein, the requirements of the Evaluation Service Report shall control.

c. Accurately locate concrete anchors and set perpendicular to surfaces from which they project.

d. Minimum embedment lengths:

Diameter Inches	Embedment Length Inches
1/4	2
3/8	2-1/2
1/2	4-1/8
5/8	4-1/2
3/4	6-1/2

e. Drilling holes:
(1) Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in the existing concrete without acceptance by ENGINEER.
(2) Determine location of reinforcing bars, or other obstructions with a non-destructive indicator device.
(3) Remove dust and debris from hole using compressed air.

f. Hole drilling equipment:
(1) Electric or pneumatic rotary type with light or medium impact.
(2) Drill bits: Carbide-tipped in accordance with ANSI B212-15.
(3) Hollow drills with flushing air systems are preferred.

(4) Where edge distances are less than 2 inches, use lighter impact equipment to prevent microcracking and concrete spalling during drilling process.

6. Deformed bar anchors:
   a. Butt weld with automatic stud welding gun as recommended by manufacturer.
   b. Ensure butt weld develops full strength of the anchor.
7. Flush shells:
   a. Use only where specifically indicated on the Drawings.
   b. Install anchors in accordance with approved ICC Evaluation Service Report. Where conflict exists between the approved ICC Evaluation Service Report and the requirements herein, the requirements of the Evaluation Service Report shall control.
   c. Accurately locate and set perpendicular to surfaces from which they project.
   d. Drilling holes:
      (1) Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in the existing concrete without acceptance by ENGINEER.
      (2) Determine location of reinforcing bars, or other obstructions with a non-destructive indicator device.
      (3) Remove dust and debris from hole using compressed air.
   e. Hole drilling equipment:
      (1) Electric or pneumatic rotary type with light or medium impact.
      (2) Drill bits: Carbide-tipped in accordance with ANSI B212-15.
      (3) Hollow drills with flushing air systems are preferred.
      (4) Where edge distances are less than 2 inches, use lighter impact equipment to prevent microcracking and concrete spalling during drilling process.
8. High strength bolts:
   a. Consider connections with high strength bolts to be slip critical structural connections, unless otherwise indicated on the PLANS.
   b. Connections with high strength bolts shall conform to AISC Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.
   c. Furnish hardened flat washer:
      (1) Under element, nut, or bolt head, turned in tightening.
      (2) On outer plies for short slotted holes.
   d. Verify adequate tightening of bolts by means of tension indicator washers placed as indicated in ASTM F 959, Figure 1.
9. Powder actuated fasteners: Use powder actuated fasteners only for applications indicated on the PLANS or specified.
10. Sleeve anchors:
    a. Do not use sleeve anchors in lieu of anchor bolts.
    b. Install anchors in accordance with approved ICC Evaluation Service Report. Where conflict exists between the approved ICC Evaluation Service Report and the requirements herein, the requirements of the Evaluation Service Report shall control.
    c. The sleeve anchor bolt shall be removable and the expansion sleeve shall be flush with the concrete surface when installed.
    d. Accurately locate sleeve anchors and set perpendicular to surfaces from which they project.
    e. Minimum embedment lengths:

Diameter Inches	Embedment Length Inches
¼	1-3/4
3/8	2-1/2
½	3-1/2
5/8	4
¾	4-1/2

f. Drilling holes:
   (1) Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in the existing concrete without acceptance by ENGINEER.
   (2) Determine location of reinforcing bars, or other obstructions with a non-destructive indicator device.
   (3) Remove dust and debris from hole using compressed air.

g. Hole drilling equipment:
   (1) Electric or pneumatic rotary type with light or medium impact.
   (2) Drill bits: Carbide-tipped in accordance with ANSI B212-15.
   (3) Hollow drills with flushing air systems are preferred.
   (4) Where edge distances are less than 2 inches, use lighter impact equipment to prevent microcracking and concrete spalling during drilling process.

11. Welded studs:
   a. Butt weld with automatic stud welding gun as recommended by the manufacturer.
   b. Ensure butt weld develops full strength of the stud.

12. Undercut anchors:
   a. Install anchors in accordance with approved ICC Evaluation Service Report. Where conflict exists between the approved ICC Evaluation Service Report and the requirements herein, the requirements of the Evaluation Service Report shall control.
   b. Accurately locate concrete anchors and set perpendicular to surfaces from which they project.
   c. Drilling holes:
      (1) Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in the existing concrete without acceptance by ENGINEER.
      (2) Determine location of reinforcing bars, or other obstructions with a non-destructive indicator device.
   d. Hole drilling equipment:
      (1) Electric or pneumatic rotary type with light or medium impact.
      (2) Drill bits: Carbide-tipped in accordance with ANSI B212-15.
      (3) Hollow drills with flushing air systems are preferred.
      (4) Where edge distances are less than 2 inches, use lighter impact equipment to prevent microcracking and concrete spalling during drilling process.
      (5) Undercut bottom of hole using cutting tools manufactured for this purpose by undercut anchor manufacturer.

3.04 – 3.10 (NOT USED)

3.11 MEASUREMENT AND PAYMENT

Unless otherwise indicated, no separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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SECTION 05500

METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Metal gratings.
   2. Metal cover plates.
   3. Preformed channel pipe supports.
   4. Miscellaneous metals.
   5. Associated accessories to the above items.

1.02 RELATED REQUIREMENTS

A. Other related work as called for on the PLANS and specified elsewhere in this or other TECHNICAL SPECIFICATIONS.

1.03 REFERENCES

The publications listed below for a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

M12-C22-A41	Aluminum Finishes.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO	Standard Specifications for Highway Bridges.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	Standard Specification for Structural Steel.
ASTM A 48	Standard Specification for Grey Iron Castings.
ASTM A 53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded, and Seamless.
ASTM A 123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
ASTM A 240	Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
ASTM A 269	Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
ASTM A 276	Standard Specification for Stainless Steel Bars and Shapes.
ASTM A 307	Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
ASTM A 325	Standard Specification for High-Strength Bolts for Structural Steel Joints.
ASTM A 489	Standard Specification for Carbon Steel Lifting Eyes.
ASTM A 490	Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.
ASTM A 500	Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

ASTM A 501	Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
ASTM A 569	Standard Specification for Steel, Carbon (0.15 Maximum, Percent) Hot-Rolled Sheet and Strip Commercial Quality.
ASTM A 570/A 570M	Standard Specification for Steel, Sheet and Strip, Carbon. Hot-Rolled, Structural Quality.
ASTM A 635/A 635M	Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot-Rolled.
ASTM A 653/A 653M	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
ASTM A 992/A 992M	Standard Specification for Structural Steel Shapes.]
ASTM B 209	Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
ASTM B 221	Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
ASTM B 308	Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
ASTM B 429	Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
ASTM F 593	Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.

AMERICAN WELDING SOCIETY (AWS)

AWS	Standard Symbols for Welding, Brazing, and Nondestructive Examination.

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM	Metal Finishes Manual.

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

OSHA	Code of Federal Regulations (CFR), Title 29, Labor, Pt. 1900-1990.

1.04 – 1.05 (NOT USED)

1.06 SUBMITTALS

A. Furnish the following in accordance with Specification Section 01300, “Submittals”.
   1. Product Data:
      a. Metal Grating.
      b. Metal Cover Plates.
   2. Shop Drawings:
      a. Metal Grating.
      b. Metal Cover Plates.
      c. Miscellaneous metals.

   3. Quality Control Submittals:
      a. Design data and calculations.
      b. Test Reports:
      c. Gratings:
         1) Grating manufacturers' calculations showing that gratings will meet specified design load, stress, and deflection requirements for each size grating for each span.
         2) Reports of tests performed.

1.07 – 1.11 (NOT USED)

PART 2 PRODUCTS

2.01 MANUFACTURERS (NOT USED)

2.02 MATERIALS AND/OR EQUIPMENT

A. General: Unless otherwise specified or indicated on the Drawings, structural and miscellaneous metals shall conform with the standards of the ASTM, including the following:

Item	ASTM Standard No.	Class, Grade Type or Alloy No.
Cast Iron		
Cast Iron	A 48	Class 40B
Steel		
Galvanized sheet iron or steel	A 653	Coating G90
Black steel, sheet or strip	A 569 A 570	--
Coil (plate)	A 635	--
Structural plate, bars, rolled shapes, and miscellaneous items (except W shapes).	A 36	--
Rolled W shapes	A 992	Grade 50
Standard bolts, nuts, and washers	A 307	--
High strength bolts, nuts, and hardened flat washers	A 325 A 490	--
Eyebolts	A 489	Type 1
Tubing, cold-formed	A 500	--
Tubing, hot-formed	A 501	--
Steel pipe	A 53	Grade B
Stainless steel		
Plate, sheet, and strip	A 240	Type 304* or 316**
Bars and shapes	A 276	Type 304* or 316**
Bolts (Type 304)	F593	Group 1 Condition CW
Bolts (Type 316)	F593	Group 2 Condition CW
Aluminum		
Flashing sheet aluminum	B 209	Alloy 5005-H14, 0.032 inches minimum thickness
Structural sheet aluminum-	B 209	Alloy 6061-T6
Structural aluminum	B 209 B 308	Alloy 6061-T6
Extruded aluminum	B 221	Alloy 6063-T42
* Use Type 304L if material will be welded. ** Use Type 316L if material will be welded.		

1. Stainless steels are designated by type or series defined by ASTM.
2. Where stainless steel is welded, use low-carbon stainless steel.

B. Plated Metal Gratings:
   1. General:
      a. Fabricate grating to cover areas indicated on the PLANS.
      b. Unless otherwise indicated on the PLANS, grating over an opening shall cover entire opening.
      c. Make cutouts in grating where required for equipment access or protrusion, including valve operators or stems, and gate frames.
      d. Band Ends of Grating and Edges of Cutouts in Grating:
         1) End Banding: 1/4 inch less than height of grating, with top of grating and top edge of banding flush.
         2) Cutout Banding: Full-height of grating.
         3) Use banding of same material as grating.
         4) Panel Layout: Enable installation and subsequent removal of grating around protrusions or piping.
         5) Openings 6 Inches and Larger: Lay out grating panels with edges of 2 adjacent panels located on centerline of opening.
         6) Openings Smaller than 6 Inches: Locate opening at edge of single panel.
         7) Where an area requires more than 1 grating section to cover area, clamp adjacent grating sections together at 1/4-points with fasteners acceptable to ENGINEER.
         8) Metal plates on plated grating panels shall be clamped to grating at 1/4-points with countersunk fasteners acceptable to ENGINEER.
         9) Fabricate plated grating panels in units of maximum 50 pounds each.
      e. Design Live Load: A minimum of 200 pounds per square foot uniform live load on the entire area of the grating area, but not less than the live load indicated on the Drawings for the area where the grating is located.
      f. Maximum Fiber Stress for Design Load: 18,000 pounds per square inch.
      g. Maximum Deflection Under Design Load: 1/240 of grating clear span.
      h. When requested by ENGINEER, test 1 section of each size grating for each span length involved on the job under full load:
         1) Furnish a suitable dial gauge for measuring deflections.
      i. Metal plate and grating shall be galvanized steel, unless otherwise specified or indicated on the PLANS.
   2. Steel Gratings:
      a. Hot-dip galvanized after fabrication in accordance with ASTM A 123.
      b. Bar Size and Spacing: As determined by the manufacturer to support design load.
      c. Bar Spacing: Maximum of 1-1/8 inches clear between bars.
      d. Manufacturers: One of the following or equal:
         1) McNichols Company.
         2) Reliance Steel Products Company, Heavy-Duty Steel Grating
         3) IKG Borden Industries, IKG Weldforged.
         4) Seidelhuber Metal Products, Inc., Type 19W4.
   3. Steel Cover Plates
      a. Hot-dip galvanized after fabrication in accordance with ASTM A 123.
      b. Cover plates shall have raised diamond pattern.

C. Preformed Channel Pipe Supports:
   1. Preformed channel pipe supports for pipe supports and other applications are specified in Contract.

D. Miscellaneous Metal:
   1. Miscellaneous Aluminum: Fabricate aluminum products, not covered separately herein, in accordance with the best practices of the trade and field assemble by riveting or bolting. Do not weld or flame cut.
   2. Miscellaneous Cast Iron:

a. General:
1) Tough, gray iron, free from cracks, holes, swells, and cold shuts.
2) Quality such that hammer blow will produce indentation on rectangular edge of casting without flaking metal.
3) Before leaving the foundry, clean castings and apply 16-mil dry film thickness coating of coal-tar epoxy, unless otherwise specified or indicated on the PLANS.

3. Miscellaneous Stainless Steel:
a. Provide miscellaneous stainless steel items not specified herein as indicated on the PLANS or specified elsewhere. Fabricate and install in accordance with the best practices of the trade.

4. Miscellaneous Structural Steel:
a. Provide miscellaneous steel items not specified herein as indicated on the PLANS or specified elsewhere. Fabricate and install in accordance with the best practices of the trade.

PART 3 EXECUTION

3.01 GENERAL (NOT USED)

3.02 PREPARATION

A. Verification of Conditions: Examine work in place to verify that it is satisfactory to receive the work of this Section. If unsatisfactory conditions exist, do not begin this work until such conditions have been corrected.

3.03 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

A. General: Install products as indicated on the Drawings, and in accordance with shop drawings and manufacturer's printed instructions, as applicable except where specified otherwise.

B. Metal Gratings:
1. General:
a. Allow 1/8-inch maximum clearance between ends of grating and inside face of vertical leg of shelf angles.
b. Horizontal bearing leg of shelf angles shall be 2 inches minimum.
c. Install aluminum plate or angles where necessary to fill openings at changes in elevation and at openings between equipment and grating.
d. Install angle stops at ends of grating.
e. Installed grating shall not slide out of rebate or off support.
f. Weld stops in place, unless otherwise specified or indicated on the PLANS.
g. Top surfaces of grating sections adjacent to each other shall lie in same plane.

2. Steel Grating:
a. Support on hot-dip galvanized structural steel rebates embedded and anchored in concrete.

3.04 – 3.10 (NOT USED)

3.11 MEASUREMENT AND PAYMENT

Unless otherwise indicated, no separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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SECTION 05520

ALUMINUM HANDRAILS

PART 1 GENERAL

1.01 SUMMARY

This Section includes the fabrication, furnishing, and installation of aluminum handrails, complete in place, at locations shown on PLANS.

1.02 RELATED REQUIREMENTS (NOT USED)

1.03 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

ASD-1	Aluminum Standards and Data
DAF-45	Designation System for Aluminum Finishes
SAA-46	Standards for Anodized Architectural Aluminum

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A193/A193M	Standard Specification for Ally-Steel and Stainless Steel Bolting Materials for High Temperature Service
ASTM B429	Standard Specification for Aluminum All Extruded Structural Pipe and Tube
ASTM F593	Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

AMERICAN WELDING SOCIETY (AWS)

AWS D1.2	Structural Welding Code Aluminum

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

29 CFR 1910	OSHA Regulation Safety and Health Standards for General Industry

INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

IBC	International Building Code

1.04 DEFINITIONS

Plans use the terms handrail and guardrail to refer to the railing system defined by this Specification and standard detail drawings.

1.05 SYSTEM DESCRIPTION (NOT USED)

1.06 SUBMITTALS

Submit the following in accordance with Specification Section 01300, “Submittals”.

A. Product data for materials used.

B. Complete shop drawings showing handrail locations, railings, posts, splice locations and expansion joint locations. Also include manufacturer’s details for connections, anchorage, splices, expansion joints, gates and other pertinent data.

C. Design calculations showing that the material meets or exceeds the allowable working stress under the applied loading conditions. Test reports may be used to complement the design calculations. Design calculations to be sealed by a Professional Engineer licensed in the State of Texas.

D. Field layout of fabricated sections to ensure proper fit during erection, after fabrication and finishing, and prior to shipment.

E. Certificate of Conformance as required in Paragraph 1.07 – Quality Assurance.

1.07 QUALITY ASSURANCE

A. All design computations and detailed drawings are to be prepared by or under the direct supervision of a Professional Engineer licensed in the State of Texas. Provide a certificate signed and sealed by same engineer stating that the computations and drawings are in conformance with specified design criteria.

B. Provide handrail system complying with International Building Code and OSHA Regulations.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver handrail to jobsite with sufficient protection to ensure arrival in acceptable and undamaged condition.

B. Store handrails on level supports above ground, not in contact with dissimilar metals. Protect to prevent damage and exposure from elements until erected. Replace or repair damaged sections at no additional cost to OWNER.

1.09 – 1.11 (NOT USED)

PART 2 PRODUCTS

2.01 MANUFACTURER(S)

A. Manufacturer: Products of the following manufacturers, provided they comply with requirements of the Contract Documents, will be among those considered acceptable, or an approved equal.
   1. Hollaender Railing Systems (Interna-Rail);
   2. Thompson Fabrication Co. (TUFrail); and

2.02 MATERIALS AND/OR EQUIPMENT

A. General

1. Handrail shall be the product of a company normally engaged in the manufacture of pipe railing.
2. Handrail shall conform to requirements of OSHA 1910.23 and applicable building code. Local building code in Austin, TX is the International Building Code.
3. Handrail and posts to be fabricated from 1½-inch nominal diameter 6063-T6 or 6061-T6 aluminum pipe, Schedule 40 minimum conforming to ASTM B429. Exposed aluminum surface to be 0.7-mil thick clear anodized finish, per Aluminum Association Designation M10-C22-A41.
4. Handrail to be 42 inches high; stair handrail to be 34 inches high, unless otherwise noted on PLANS. Centerlines of posts and handrails to be in same plane. Locate intermediate rails as shown on PLANS.
5. Unless shown otherwise in PLANS, post spacing not to exceed 5 feet for horizontal handrail and 4 feet for stair handrail (measured horizontally). The manufacturer must reduce the post spacing and/or add dowels, as required to meet the loading requirements.
6. Provide a 4-inch-high extruded aluminum toe plate that attaches to the posts with clamps that will allow for horizontal expansion and contraction between posts. Toe plate to have not more than 1/4-inch clearance above floor level and provided on all walkways and stair landings. Provide notch in toe plate at post as required to maintain specified clearance.
7. Handrail system, which consists of three horizontal rail members, posts, connections and anchorages, shall be designed to withstand a 200-pound concentrated load applied at any point and in any direction or a 50 lb./ft. uniform load applied in any direction. Concentrated and uniform loads need not be assumed to act concurrently. The posts and associated floor flange anchorage shall be designed to withstand a 200-pound concentrated load applied at the top rail.
8. Provide expansion joint splices in all rails of handrail and toe board at not greater than 20 feet spacing and at expansion joints in concrete structure. Minimum projection of expansion splice inside adjacent pipe shall be 1½".
9. Splices and expansion joints in the railing system components shall be located within 8 inches of posts or other railing system supports.
10. Provide 1/4-inch weep holes at low points in all handrails and posts to prevent trapping of moisture.
11. Removable handrail to have vertical pipe supports fastened as shown on PLANS. Unless otherwise indicated, fabricate removable handrail in unit sections not exceeding 10 feet long with at least three vertical supports, including one at each end.
12. Handrails attached to load-bearing walls to be mounted with aluminum or stainless steel brackets. Fasten each bracket with a minimum 3/8-inch diameter Type 316 stainless steel expansion bolt set into the wall and tapped into bracket. Bracket to have a 3-inch projection from wall and be uniformly spaced approximately 4 feet with the end brackets not more than 12 inches from the ends of the handrails.
13. Posts and rails to be continuous throughout their sectional lengths. Curved members to be formed to true radii, free from dye marks or surface abrasions. Furnish handrail in shop fabricated sections, complete with accessories, including gates, hardware, closure caps for rail terminations, base trim, and anchorages.
14. Posts shall not interrupt the continuation of the top rail at any point along the railing, including corners and end terminations (OSHA 1910.23). The top surface of the top railing shall be smooth and shall not be interrupted by a projecting fitting.

15. Aluminum surfaces in contact with concrete, grout or dissimilar metals will be protected with a mylar isolator, bituminous paint or other approved material.
16. Handrail system posts are to be anchored to concrete structures with Type 316 stainless steel bolts. Bolts and floor flange shall be designed to resist a 200-pound load applied horizontally to the top rail. Bolt manufacturer's published shear and pullout values shall be reduced for spacing and edge distance conditions as shown on plans.
17. Safety Chains: Construct safety chains of stainless steel, straight link type, 3/16-inch diameter, with at least twelve links per foot, and with boat type snap hooks on each end. Provide S.S. 3/8-inch bolt with 3/4 -inch eye diameter for attachment of chain, anchored as indicated. Supply a minimum of two chains or as noted on PLANS, 4 inches longer than the anchorage spacing, for each guarded area. Locate safety chain where indicated.

B. Nonwelded Aluminum Handrails
1. Fittings to be extruded or cast aluminum, 6063 Aluminum Alloy with a minimum 0.4-mil thick clear anodized finish per Aluminum Association Designation M43C22A4l.
2. The handrail shall be made of pipes joined together with component fittings. Components that are glued or pop-riveted at the joints will not be acceptable. All components must be mechanically fastened with stainless steel hardware.
3. Fitting shall be an internal double-prong expandable fitting that is activated by a stainless steel or aluminum set screw. The fitting shall be externally connected to the pipe by means of an anodized aluminum tubular rivet nut, and stainless steel socket head cap screw. All fittings, elbows, wall returns, and caps to be flush-type. Exposed fasteners to be set flush or recessed. All fasteners to be Type 316 stainless steel.
4. Unless otherwise noted on PLANS, all handrails to be nonwelded aluminum.

C. Welded Aluminum Handrail
1. Handrail and posts to be joined by welding only if indicated on PLANS. Welding to consist of flush-type weld fittings or coping of pipe ends to conform with adjoining pipe and welding. Welds to be ground smooth and flush.
2. Elbows, capped terminations, and wall returns to be formed by flush fittings. Secure rails terminating against masonry or concrete with flanged fittings and anchor bolts.

2.03 FABRICATION

Furnish railings in shop-fabricated sections, complete with accessories, including gates, plated hardware, closure caps for rail termination, base trim, and anchorages.

2.04 SOURCE QUALITY CONTROL (NOT USED)

PART 3 EXECUTION

3.01 - 3.02 (NOT USED)

3.03 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

A. Handrail to be installed by fabricator in strict compliance with fabricator's instructions. Install handrail plumb and within a tolerance of 1/4-inch maximum deviation either side of the longitudinal centerline. Cuts to be clean and straight, free from burrs and nicks.

B. Posts embedded in concrete to be set in sleeves with quick-setting non-shrink grout.

C. Install removable and permanent handrail units with bolted floor type flanges.

D. Use of shims, washers, wedges, or similar devices are not allowed when plumbing or aligning handrail.

3.04 - 3.10 (NOT USED)

3.11 MEASUREMENT AND PAYMENT

No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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SECTION 09902

PAINTING AND PROTECTIVE COATINGS

PART 1 GENERAL

1.01 SUMMARY

A. Furnish and apply, as specified herein, paint and protective coatings to all surfaces, except steel water storage tanks, unless specifically excluded by this Section.

1.02 RELATED REQUIREMENTS

A. PLANS define special coating requirements.

B. Related work as called for on PLANS, or in this or other TECHNICAL SPECIFICATION Sections.

1.03 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP-1	Surface Preparation Specification No. 1 - Solvent Cleaning
SSPC SP-2	Surface Preparation Specification No. 2 - Hand Tool Cleaning
SSPC SP-3	Surface Preparation Specification No. 3 - Power Tool Cleaning
SSPC SP-5	Surface Preparation Specification No. 5 - White Metal Blast Cleaning
SSPC SP-6	Surface Preparation Specification No. 6 - Commercial Blast Cleaning
SSPC SP-7	Surface Preparation Specification No. 7 - Brush-Off Blast Cleaning
SSPC SP-8	Surface Preparation Specification No. 8 - Pickling
SSPC SP-10	Surface Preparation Specification No. 10 - Near-White Blast Cleaning

NATIONAL ASSOCIATION OF CORROSION ENGINEERS (NACE)

NACE No. 1	White Metal Blast Cleaning
NACE No. 2	Near-White Blast Cleaning
NACE No. 3	Commercial Blast Cleaning
NACE No. 4	Brush-Off Blast Cleaning

1.04 DEFINITIONS (NOT USED)

1.05 SYSTEM DESCRIPTION

A. Surfaces receiving coatings include:
1. Equipment, machinery, and metal surfaces.
2. Interior surfaces, as noted in room finish schedule.
3. Concrete surfaces, including concrete blocks (when noted on PLANS).
4. Threads on field-threaded galvanized pipe and conduit.
5. All cabinet and woodwork. (Stain finish unless otherwise noted.)
6. Interior concrete surfaces of new lift station wet wells.

7. Paint concealed structural steel and steel joists, after erection of deck and before steel is enclosed.
8. Procedures and coating systems specified herein are in addition to shop priming and surface treatment specified in other TECHNICAL SPECIFICATION Sections.

B. Unless otherwise noted or shown, the following areas or items do not require coating:
1. Non-ferrous and corrosion-resistant ferrous alloys such as copper, bronze, monel, aluminum, stainless steel, chromium plate, and atmospherically exposed weathering steel, except where:
   a. Required for electrical insulation between dissimilar metals;
   b. Aluminum and stainless steel are embedded in concrete or masonry, or aluminum is in contact with concrete or masonry;
   c. Color coding of equipment and piping is required.
2. Non-metallic materials such as glass, PVC, porcelain, and fiberglass, except as required for architectural painting or color coding.
3. Pre-finished electrical and architectural items such as motor control centers, switchboards, switchgear, panelboards, transformers, disconnect switches, panelboards, acoustical tile, cabinets, elevators, building louvers, etc., except when color coding of equipment is required.
4. Non-submerged electrical conduits attached to unpainted concrete surfaces.
5. Items specified to be galvanized after fabrication unless specified elsewhere or subject to immersion.
6. Insulated piping except as required for architectural painting or color coding.

1.06 SUBMITTALS

Submit the following in accordance with Specification Section 01300, “Submittals”.

A. Painting Schedule: Submit list indicating major items to be painted, preparation, paint manufacturer, product designation, and dry mil thickness.

B. Panels
1. Submit panels containing samples of proposed paints and coatings. Include three displays of each kind and color of paint used. Panel to be representative of material to be coated.
2. Mark panels to indicate respective types of surfaces to which several kinds and colors of paint, stain, and coating are applied.

C. Samples: If requested by OWNER, submit 1/4 pint of each kind of paint or stain proposed for use. Do not deliver materials to site until representative samples (if requested) have been approved.

D. For all materials, furnish ENGINEER with two sets of manufacturer’s printed instructions describing surface preparation procedures and application procedures including environmental limits (temperature and humidity).

E. List of five similar projects in accordance with Paragraph 1.07 B.1.

F. Material Safety Data Sheets (MSDS) for all coatings, solvents, sealers, and paints to be utilized.

1.07 QUALITY ASSURANCE

A. Manufacturer: All paints, sealers, and coatings to be manufactured by those firms listed in Table 2. Products of equal quality by other manufacturers will be considered, subject to review of written submittal that includes product data and a detailed paint and coating schedule.

B. Workmanship

1. Furnish workers who perform quality work and who are experienced and knowledgeable in the surface preparation and application of high-performance industrial coatings. Submit list of five similar projects which have been prepared and coated by the personnel which the CONTRACTOR proposes to employ for this project.
2. Submit manufacturer's written instructions on cleaning and coating prior to any surface preparation or coating.

C. Whenever possible, all coatings should be from single manufacturer. Unless otherwise specified, coating materials for a specific surface or piece of equipment are to be from a single manufacturer.

D. All coatings provided for use on this project in the field or from equipment suppliers will be in compliance with Federal, State, and local laws, regulations and ordinances related to items such as lead, chromate, carcinogens and volatile organic compounds. For potable water systems, all coatings and products used on surfaces 1) in contact with the water, 2) within 1 foot above the high water level and below the high water level, or 3) in contact with materials to be introduced into the water, to be National Sanitation Foundation (NSF) approved for potable water service.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver to site in original, sealed containers with manufacturer's label attached.

B. Store in a protected area that is heated or cooled to maintain temperature range recommended by manufacturer. Protect all materials from weathering and extreme temperatures.

C. Waste and any hazardous material remaining at the end of the day to be discarded in accordance with national, state, and local regulations.

1.09 - 1.11 (NOT USED)

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Coating manufacturers are listed by generic type and service in Table 2 attached to this Section.

2.02 MATERIALS

A. Tables 1 and 2 in this Section include the paint, protective coatings, and sealers for this project. Furnish all such special materials required for the manufacturer's coating systems whether or not included in the Tables.

B. Products to comply with Federal, State, and local requirements limiting the emission of volatile organic compounds. The maximum volatile organic content of the combination of coating and thinner is not to exceed the following limits (whichever is less):
1. 3.5 pounds per gallon; or
2. The Federal, State or local limit.

C. Colors
1. OWNER reserves the right to select colors.
2. Submit list of items to be painted and color charts for each type of surface.
3. Formulate with colorants free of lead or lead compounds.
4. Proprietary color identification is for selection purposes only. Any authorized manufacturer may supply matches.

D. Safety Color Codes: Follow OSHA requirements of 29 CFR, Part 1910.144 for "Safety Color Codes for Marking Physical Hazards". The following general requirements are set forth as a guide.

1. Red: Fire protection equipment, danger signs, and fire exit signs. Portable containers of flammable material to be red with yellow band or name of contents stenciled in yellow.
2. Orange: Moving or rotating parts of equipment protected by guards, including shafts and couplings, pulleys, and sprockets. (Do not paint wearing surfaces.)
3. Yellow: Caution signs and all physical hazards, including outside levers and weights on check valves, lower pulley blocks and hooks, sprockets and chains on valve operators, inside of openings adjacent to step or ladders, platforms provided for vertical ladders at transition levels, exposed unguarded edges of pits, platforms and walls subject to being struck, and any piping or equipment extending into normal operating areas.
4. Green: To designate "Safety" and location of first-aid equipment such as gas masks, first-aid kits, and safety deluge showers.
5. Black and White: To indicate areas that must remain clear, such as areas around first-aid, fire-fighting, and other emergency equipment.

E. Piping Color Coding: The identification of process piping and chemical feed lines is to be accomplished by various colors of paint. Color coding to be by solid color and labels. Provide pipe color coding in accordance with applicable Specification Section.

1. Wastewater Plant Color Codes:

LETTERING	COLOR OF PIPE
Sludge	Brown
Natural gas	Red
Potable water	Light Blue
Chlorine	Yellow
Sulfur dioxide	Lime green with yellow bands
Sewage	Grey
Compressed air	Light Green
Heated water	Blue with 6 inch red bands spaced 30 inches apart
Power conduit	In compliance with the National Fire Protection Association 70 National Electrical Code®
Reclaimed water	Purple with black lettering
Gray water	Purple with yellow writing
Instrument air	Light green with dark green bands;
Liquid alum	Yellow with orange bands
Alum (solution)	Yellow with green bands
Ferric chloride	Brown with red bands
Ferric sulfate	Brown with yellow bands
Polymers	White with green bands
Ozone	Stainless steel with white bands
Raw water	Tan
Effluent after clarification	Dark green

2. Piping containing gas, chlorine or other hazardous materials are to be color coded when exposed, located out of view, or buried.
3. Non-potable water lines are to be painted white and marked with black lettering at maximum 5-foot intervals.

2.03 - 2.04 (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Use one convenient location for storing and mixing of materials and keep fire extinguisher available in this area as long as location is used for such purpose.

B. Thinners and Solvents: Use only those thinners and solvents specified in paint formulas of paint being used and mix in proportions recommended by paint manufacturer.

C. Coverage: As recommended by paint manufacturer and sufficient to obtain minimum mil thickness specified. Do not exceed maximum thickness specified by manufacturer, if applicable. After final coat is applied, check with elecometer or Mikrotest dry film thickness gauge.

D. Drying Time: Between successive coats, allow drying time as specified by paint manufacturer. Do not apply additional coats until previous coat is completed.

E. Provide adequate ventilation for proper curing. Keep materials sealed when not in use.

F. Environmental conditions such as temperature and humidity to be within the ranges recommended by the coating manufacturer.

G. Finish coats to be smooth, free of brush marks, streaks, laps or pile up of paints, and skipped or missed areas. Finished metal surfaces to be free of voids or pinholes in any coat when tested with a low voltage detector.

3.02 PREPARATION

A. General
   1. Perform all preparation and cleaning procedures in strict accordance with paint manufacturer's instructions and as specified for each substrate.

B. Concrete Surfaces
   1. Prior to painting, surfaces to be free of all latent matter, burrs, and fins, using one or more of the following methods.
      a. Remove oil and grease with detergent and thoroughly rinse with fresh water.
      b. Abrasive blasting may be used only if machinery or other equipment in vicinity of work is adequately protected. Also, avoid settling of dust or grit on freshly painted surfaces.
      c. Wash concrete surfaces with 10 percent solution of muriatic acid, then wash clean and free of scale, mortar, dust, moisture, and other foreign matter.
      d. Repair all honeycomb surface defects by coating cleaned honeycombed area with epoxy bonding agent and filling voids with non-shrink grout leaving a smooth uniform concrete surface.
   2. If curing compound is used, it must be removed prior to coating.

C. Metal Surfaces
   1. Clean metal surfaces by abrasive blasting in shop as required by Table I and leave clean, dry, and ready to receive prime coat. Provide moisture separators to effectively remove all oil and free moisture from air supply. Cleanliness of air to be tested by impinging an abrasive-free air stream onto a white cloth for one minute. If oil or moisture is detected, air source to be shut down and corrected.
   2. Remove all dust and abrasives from surfaces by brushing or blowing with clean, dry air. Remove abrasive grit around and between joints of connecting members.

3. Perform field abrasive blasting only if required to correct unsatisfactorily cleaned and shop-primed metal and when approved by ENGINEER.
4. Removal of Oil and Grease: Remove oil and grease with a solvent approved by coating manufacturer, or by steam combined with detergent (in accordance with SSPC SP-1). Use of gasoline, kerosene, naphtha, or carbon tetrachloride not permitted.
5. Brushing, Scraping, Grinding, and Chipping: In field work, if abrasive blasting is not possible, scrapers, wire brushes, and other suitable grinding or chipping tools may be used (in accordance with SSPC SP-2 or SP-3) for removal of existing paint coatings prior to repainting, or for cleaning, before applying second coats.
6. Surface to be coated on same day as cleaned and before rust bloom occurs. Surfaces which have been cleaned but which have started to show signs of rust or dirt are to be cleaned again prior to coating at no additional expense to OWNER.
7. All surfaces to be at least 5°F or higher above the dew point and remain this way when blasting, priming, or coating.

D. Galvanized Surfaces
1. Clean surface with mineral spirits to remove oil residue.
2. Dry with a clean cloth.

E. Wood Surfaces
1. Clean soiled surfaces in accordance with coating manufacturer's instructions.
2. Sand to a smooth even surface and then dust off.
3. Apply shellac to all knots, pitch and resinous sapwood before priming coat is applied.
4. Fill nail holes, cracks, open joints and other defects with putty after priming coat has dried. Tint putty to match finish color. Sand smooth after putty dries.
5. Apply priming coats to woodwork as soon as practical after woodwork is delivered.
6. Top and bottom edges of all wood doors to be primed and sealed after fitting and before final hanging.

F. Gypsum Wallboard
1. Fill narrow, shallow cracks and small holes with spackling compound.
2. Rake deep, wide cracks and deep holes.
   a. Dampen with clean water.
   b. Fill with thin layers of drywall joint compound
3. Allow repairs to dry.
4. Sand smooth. Do not raise nap of paper on wallboard.

G. Plastic Surfaces:
1. Hand sand plastic surfaces to be coated with a medium grit sandpaper to provide tooth for coating system.
2. For surfaces with existing coatings, completely remove any existing coating and prepare surface as mentioned above.

3.03 ERECTION, INSTALLATION AND APPLICATION INSTRUCTIONS

A. General
1. Do not apply initial coating until moisture content of surface is within limitations recommended by paint manufacturer. Test with moisture meter.
2. Slightly vary the color of successive coats.
3. Sand and dust between each coat to remove defects visible from a distance of 5 feet.
4. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.
5. Change colors at corner of stop where colors differ between adjoining spaces or rooms and where door frames match wall colors.

6. Do not proceed with field applied painting of shop-coated items until any defective work has been cleaned by sandblasting.

B. Brush Application
   1. Brushes: Use first-quality hog hair or suitable synthetic bristle brushes. Use of horsehair bristle brushes not permitted. Keep brushes clean and free from accumulation of dried paint or dirt, and when brushes for oil or varnish base paints are not in use, keep them suspended in raw linseed oil bath. Clean brushes with proper solvent before reuse.
   2. Application: Apply in uniform thickness consistent with specified coverage and with sufficient cross-brushing to ensure filling of surface irregularities. Exercise particular care in painting around bolt heads and nuts and in corners and other restricted spaces.

C. Conventional Spray Application: Apply with adjustable air gun equipped with suitable water trap to remove moisture from compressed air, and with paint pot having air driven or mechanical agitator. Adjust width of spray to meet the requirements of the surface being coated with suitable air pressure for the particular type of paint being used. Make frequent checks to ensure correct spreading rate and coating and apply without sags, runs, or "orange peel" effect. Correct all such imperfections. Take special care to cover edges, corners, and bolt heads, without bridging over of paint film.

D. Airless Spray Application: Equipment used for airless spray to be designed for, and capable of handling, the volume and pressures necessary to ensure smooth and proper application. Hoses to be specifically designed for the viscosity of the material being sprayed and be of the non-static, self-grounding type. Tips to be properly sized to ensure complete atomization and the spray pattern is to be continuous and free of all fingering effects.

E. Roller Application: Proper length nap rollers to be used to ensure a smooth application free of runs, sags, roller marks, or air bubbles. Use longer nap for rougher surfaces when specified on PLANS. Phenolic core lambs wool type rollers to be used when polyurethanes, epoxies, or other types activated coatings are applied by roller. Standard type rollers to be used on water based and enamel coatings. Rollers to be of sufficient quality to leave finished surfaces free of lint, roller nap, runs, sags, and other imperfections. Roller is not to exceed 24 inches in length.

F. Metal Surfaces
   1. Shop-prime metal surfaces, if required, prior to delivery to job site.
   2. After delivery and prior to installation, keep all coated metal surfaces clean and free from corrosion. Clean and touch up or repaint damaged areas with additional primer.
   3. After erection or installation of metal work, clean and touch up all rust spots, all places where primer has been rubbed or scraped off, and all bolts and nuts. After previously applied paint has hardened, and when surfaces to receive succeeding coats of paint have been cleaned and dried, apply finish paint in accordance with Tables 1 and 2. Allow 7 days or more, as recommended by coating manufacturer, for curing of final coat for submerged surfaces.
   4. Factory-Finished Equipment: After installation of factory-finished machinery and electrical equipment, check base coats carefully and touch up all damaged surface areas. Do not paint nameplates, serial number bases, chrome, or bronze trim. Clean off any excess paint that impairs convenient removal of covers on gauges, instrumentation, or other equipment fitted with doors or covers.
   5. Factory-Primed Equipment: Delay final field coating to manufacturer's primed equipment until equipment has been installed and is in proper working order in accordance with the applicable Section.

G. Mixing and Tinting
   1. Deliver paints and enamels ready mixed to job site.
   2. Accomplish job mixing and job tinting only when acceptable to the ENGINEER.
   3. Mix only in mixing pails placed in suitably sized non-ferrous or oxide resistant metal pails.
   4. Use tinting colors recommended by manufacturer for the specific type of finish.
   5. Multiple-Component Coatings:
      a. Prepare using all the contents of the container for each component as packaged by the manufacturer.
      b. No partial batches permitted.
      c. Do not use multiple component coatings that have been mixed beyond their pot life.
      d. Provide small quantity kits for touch up painting and for painting small areas.
      e. Mix only components specified and furnished by coating manufacturer.
      f. Do not intermix additional components for reasons of color or otherwise, even within the same generic type of coating.

H. Special Requirements: Cast iron or ductile iron piping and valves for interior and exterior aboveground installation with a factory-applied bitumastic or asphaltum varnish coating to be cleaned by abrasive blasting to a NACE No. 3 finish for interior installations and a NACE No. 2 finish for exterior surfaces. Primer and finish coat to be applied in accordance with Table 1. If primer is not applied within 24 hours, surfaces to be retreated.

3.04 REPAIR/RESTORATION

A. Leave all parts of moldings and ornaments clean and true to details with no undue amount of paint in corners and depressions.

B. Remove all masking products used to protect hardware or built-in work.

C. Final Cleaning and Touch Up
   1. Touch up and restore finish where damaged.
   2. Do not mar surface finish of item being cleaned.

D. Refinish whole wall where portion of finish has been damaged or is not acceptable.

E. Damaged Coatings, Pinholes and Holidays
   1. Feather edges and repair in accordance with recommendations of coating manufacturer.
   2. Repair fusion bonded coatings as recommended by original applicator. Applicator to furnish liquid repair kits for this purpose as recommended by the coating manufacturer.
   3. Apply finish coats, including touch up and damage-repair coats, in a manner which presents a uniform texture and color-matched appearance.

F. Unsatisfactory Application
   1. If coating has improper finish color or insufficient film thickness: Clean and top coat surface with specified material to obtain specified color and coverage. Obtain and follow specific surface preparation information for top coating from coating manufacturer.
   2. Hand or power sand visible areas of chipped, peeled, or abraded paint, and feather edges. Follow with primer and finish coat in accordance with this Section. Depending on extent of repair and appearance, a finish sanding and top coat may be required.
   3. Evidence of runs, sags, bridges, shiners, laps, or other imperfections to be cause for rejection.

4. Repair defects in coating system per written recommendations of coating manufacturer.
5. Leave all staging in place until ENGINEER has inspected surface or coating. Replace staging removed prior to inspection and approval by ENGINEER.

3.05 FIELD QUALITY CONTROL

A. Schedule field operations to avoid settling of dust or grit on freshly painted surfaces, and adequately protect machinery or other equipment in vicinity of abrasive blasting work.

B. Request review by OWNER of first finished room, space, or item, of each color scheme for color, texture, and workmanship.

C. Use first acceptable room, space or item (as determined by OWNER), as project standard for each color scheme.

D. For spray application, paint an area no smaller than 100 square feet as the project standard.

3.06 ADJUSTING (NOT USED)

3.07 CLEANING

A. During the progress of the work, remove from the project site at the close of each day's work, all oily rags, discarded materials, rubbish, cans, and dispose of in accordance with national, state, and local regulations.

B. On completion of operations, remove all spots, oil, and stain from all surfaces and leave entire project in clean condition as far as this work is concerned.

C. Remove from premises all containers and debris resulting from this work and dispose of in accordance with Federal, State and local regulations.

D. Upon completion of the work remove staging and scaffolding from the site.

3.08 TESTING AND INSPECTION

A. CONTRACTOR is to perform routine quality control testing on each coat to ensure the integrity of the protective coating. At a minimum, the following tests are to be performed.
1. Dry film thickness.
2. Holiday testing.
3. Any additional tests as recommended by coating manufacturer.

B. Any and all testing performed by the ENGINEER is for the sole purpose of verifying compliance with this specification. CONTRACTOR is not to rely upon testing performed by the ENGINEER as a means of quality control.

C. CONTRACTOR to provide the following equipment for use by the ENGINEER.
1. One magnetic pull-off type, non-destructive paint film thickness gauge, such as a Mikrotest thickness gauge. Thickness gauge to become OWNER's.
2. One set of certified coating thickness calibration standards produced by the U.S. Department of Commerce. Calibration standards to become OWNER's.
3. One "wet sponge", low voltage, D.C. type holiday detector, such as the Tinker-Rasor Electrical Holiday Detector.

D. Provide the ENGINEER with the proper safety equipment for observation and testing of the applied coating.

E. To facilitate ENGINEER's inspection of coated surfaces, CONTRACTOR to provide scaffolding/rigging and adequate illumination as required to perform the dry film thickness reading and holiday test inspections as required by this specification and the referenced standards. Provide personnel to move the scaffolding, lighting, or rigging at the request of the ENGINEER.

F. No equipment is to be placed in service until the protective coating has been tested and approved by the ENGINEER.

3.09 PROTECTION

A. CONTRACTOR is solely and completely responsible for conditions of the job site including safety of all persons (including employees) and property during performance of the work. This requirement applies continuously and is not limited to normal working hours. Conform with safety provisions of the U.S. Department of Labor, Occupational Safety and Health Act, any equivalent State law, and all other applicable Federal, State, and local laws, ordinances, and codes.

B. Protect floors and all other areas where work is done, with suitable drop cloths.

C. Remove, mask, or otherwise protect all hardware, hardware accessories, lighting fixtures, switchplates, machined surfaces, couplings, shafts, bearings, labels, nameplates, etc. and other surfaces not intended to be painted prior to surface preparation and painting. Reinstall the removed items by workmen skilled in the trades involved.

D. CONTRACTOR is cautioned of the potential risk of damage and/or nuisance to the adjoining property and/or structures. CONTRACTOR is responsible for providing necessary equipment and/or controls to minimize the carryover of dust, paint, and abrasives. If excessive dust, paint, or abrasives are determined by the OWNER, or their representative, to be affecting adjoining property and/or structures, CONTRACTOR to utilize shrouds, drop tubes, or other means to confine a minimum of 95 percent of the abrasive, paint, and other material to the associated work area.

E. Protect working parts of mechanical and electrical equipment from damage. Mask openings in motors to prevent paint and other materials from entering motor.

3.10 SCHEDULES

A. Attachments to this Section define System Schedule (Table 1) and Coating Schedule (Table 2).

3.11 MEASUREMENT AND PAYMENT

No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

TABLE 1 – SYSTEM SCHEDULE

Type of Surface	Exposure	Surface Preparation/ Cleaning	Table 2 – Material Reference				Minimum Total Mils Thickness
			Primer	1st Coat	2nd Coat	3rd Coat	
Clay or Brick Masonry	Exterior(1)	Manufacturer's Specification	—	1	—	—	NA
Concrete Block Buildings	Exterior	Manufacturer's Specification	—	2	4	4	3.0 (Finish Coat)
Concrete Block Walls	Interior(2) Painted	- Paragraph 3.02 B	—	3	4	4	3.0 (Finish Coat)
	Interior(2) Sealed	- Paragraph 3.02 B	—	3A	—	—	NA
Concrete Walls and Ceilings	Interior	Paragraph 3.02 B	—	3	4	4	3.0 (Finish Coat)
Wood	Exterior and Interior	Manufacturer's Specification	10	11	11	—	4.5
Wood, Clear Finish, Satin	Interior	Manufacturer's Specification	23, 24	25	26	26	4.0
Wood, Clear Finish, Gloss	Interior	Manufacturer's Specification	23, 24	25	27	27	4.0
Wallboard (Semi-Gloss)	Interior	Manufacturer's Specification	19	20	22	22	4.0 + texture
Wallboard (Flat)	Interior	Manufacturer's Specification	19	20	21	21	4.0 + texture
Metal Doors, Frames and Windows	Exterior and Interior	NACE-#4 1.0 Mils Surface Profile	18	9	—	—	4.0
Structural and Misc. Steel	Exterior	NACE-#2 1.0-2.0 Mils Surface Profile	16	18	9	—	7.0
Structural and Misc. Steel	Interior	NACE-#3 1.0-2.0 Mils Surface Profile	16	17	—	—	5.5
Piping and Valves	Interior(2)	NACE-#3	6	17	—	—	4.5
	Exterior(1)	NACE-#2 1.0-2.0 Mils Surface Profile	6	18	9	—	6.0
Valves and Bolting on C.I. Pipe	Buried	—	—	14	14	—	32.0

TABLE 1 – SYSTEM SCHEDULE

Type of Surface	Exposure	Surface Preparation/ Cleaning	Table 2 – Material Reference				Minimum Total Mils Thickness
			Primer	1st Coat	2nd Coat	3rd Coat	
Factory Finished Machinery, Electrical, and Motors(3)	Interior and Exterior	Hand Clean	5(4)	8(5)	8(5)	—	4.5
Galvanized Steel	Interior	Solvent Cleaning	15	17	—	—	2.9
Galvanized Steel and Galvanized Pipe Conduit Threads	Exterior	Solvent Cleaning	15	18	9	—	4.4
Wastewater Treatment Plant Equipment, Piping	Submerged(6)	NACE-#2 2.0-3.0 Mils Surface Profile	28	29	—	—	45.0
Wastewater Wet-Well	Interior Surfaces	Paragraph 3.02 B	6	13	13	—	22.0
Special Surfaces Noted on PLANS	Surfaces as Shown on PLANS	Hydroblast and SSPC SP-7(8)	28	29	—	—	125.0

NOTES:
(1) Surface or piping above ground exposed to weathering.
(2) Surface or piping above ground sheltered from weathering.
(3) Use coating system per equipment Section when specified.
(4) Optional: Use manufacturer's standard primer if compatible with specified finish coats.
(5) Optional: Use manufacturer's standard finish coat.
(6) Piping or equipment that is submerged or partially submerged in a fluid.
(7) Coatings used must be in the latest publication of National Sanitation Foundation (NSF) ANSI/NSF Standard 61.
(8) Shop priming on iron/steel materials is not required. Surface preparation and primer are done in field. Concrete surface preparation involves ¼″ wide × ¼″ deep saw cut to anchor coating to surface.

TABLE 2 – COATING SCHEDULE

Symbol	Min. Dry Mils Per Coat*	Service	Generic Type	Brand and Manufacturer
1.	NA	Primary Sealer	Chemical Penetrant	Aqua-Gard - CreteGard Corp. Seal Krete - ICI Devoe #89424
2.	NA	Weather-proof Primary Sealer	Acrylic Emulsion	ACRO 2290 DTM Acrylic Latex - ACRO Amercoat 148 - Ameron Tru-Glaze 4010 - ICI Devoe
3.	NA	Primary Sealer	Vinyl-Acrylic Emulsion with Epoxy Esters	ACRO 1153 Latex Block Filler - ACRO Amercoat 148 - Ameron Blaxfil 4000 - ICI Devoe
3A.	NA	CMU, Clear Block Sealer	Siloxane Sealer, 10% Siloxane-Acrylic Emulsion	OKON W-2 Saver Systems WB Aqua-Trete EM - Sivento
4.	1.5	Finish Coat	Acrylic Emulsion	ACRO 2288 Exterior Latex - ACRO Amercoat 220 - Ameron LifeMaster-Pro 4226 - ICI Devoe
5.	1.5	Metal Primer	Alkyd	ACRO 1104 Heavy Duty Primer - ACRO Amercoat 5105 - Ameron Carbocoat 150 - Carboline Devguard 4160 - ICI Devoe
6.	2.0	Metal Primer or Concrete Surfaces	Polyamide Cured Epoxy Resin	ACRO 4422 Epoxy Primer - ACRO Amercoat 385PA - Ameron Carboguard 888 - Carboline 13-R-62-Epoxy Primer - Valspar BarRust 231 - ICI Devoe
7.**	2.0-4.0 (as recommended)	Metal Primer	Polyamide Cured Epoxy Resin	ACRO 4460 Chemical Resistant Epoxy - ACRO Amercoat 385PA - Ameron Carboguard 561 - Carboline Valspar 90HS - Valspar BarRust 233H - ICI Devoe
8.	1.5	Finish Coats	Alkyd, Straight Long-Oil	ACRO 2214 Heavy Duty Enamel - ACRO Amercoat 5450 - Ameron Carbocoat 139 - Carboline Devguard 4308 - ICI Devoe
9.	2.0	Finish Coat	Aliphatic Urethane	ACRO 4429 Polyurethane - ACRO Amercoat 450HS - Ameron Carbothane 134HG - Carboline V40 Polyurethane Enamel - Valspar Devthane 389 - ICI Devoe
10.	1.5	Wood Primer	Oil Base	ACRO 2214 Enamel (Thinned 10%) - ACRO Amercoat 5105 - Ameron Carbocoat 139 - Carboline Ultrahide 2110 - ICI Devoe
11.	1.5	Finish Coat	Alkyd, Straight	ACRO 2214 Heavy Duty Enamel -

TABLE 2 – COATING SCHEDULE

Symbol	Min. Dry Mils Per Coat*	Service	Generic Type	Brand and Manufacturer
			Long-Oil	ACRO Amercoat 5405 - Ameron Carbocoat 139 - Carboline Devguard 4308 - ICI Devoe
12.**	4.0-6.0 (as recommended)	Submerged Steel, Iron, or Concrete Surface	Polyamide-Cured Epoxy Resin	ACRO 4460 Chemical Resistant Epoxy - ACRO Amercoat 370 - Ameron Carboguard 561 - Carboline BarRust 231 - ICI Devoe
13.	10	Submerged Steel, Iron, or Concrete Surface	Coal-Tar Epoxy Two Component	ACRO 4467 Coal Tar Epoxy - ACRO Amercoat 78HB - Ameron Bitumastic 300M - Carboline
14.	16	Buried Steel or Iron	Tar-Base Pitch	ACRO 8500 Heavy Duty Coal Tar - ACRO Bitumastic No. 50 - Kop-Coat Devtar 247 - ICI Devoe
15.	0.4	Galvanized Metal Primer	Vinyl Wash Primer	ACRO 1162 Vinyl Wash Primer - ACRO Galva-Prep - Ameron Rustbond Penetrating Sealer - Carboline Devran 205 - ICI Devoe
16.	3.0	Steel Above Ground & Above Waterline	High Ratio Silicate Inorganic Zinc	ACRO 5502 Inorganic Zinc - ACRO Dimetcote 9 - Ameron V13-F-12 Inorganic Zinc - Valspar Catha-Coat 302H - ICI Devoe
17.	2.5	Steel Interior	Polyamide Cured Epoxy Resin	ACRO 4460 Chemical Resistant Epoxy - ACRO Amercoat 385 - Ameron Carboguard 561 - Carboline Bar-Rust 231, Devran 224HS - ICI Devoe
18.	2.0	Intermediate Finish		ACRO 4460 Chemical Resistant Epoxy - ACRO Amercoat 385 - Ameron Carboguard 561 - Carboline Devran 220 - ICI Devoe
19.	NA	Texture	Emulsion	Ready-Mixed Texture Compound - U.S.Gypsum Speedhide Texture Emulsion - PPG
20.	1.2	Sealer	Vinyl-Latex	Quick-Drying Latex Sealer, 6-2 - PPG Interior Vinyl Latex Primer-Sealer, 50801 - Devoe

TABLE 2 – COATING SCHEDULE

Symbol	Min. Dry Mils Per Coat*	Service	Generic Type	Brand and Manufacturer
21.	1.4	Finish Coat-Flat	Synthetic Alkyd Resin	Alkyd Flat Wall Enamel - Negley Speedhide Alkyd Flat, 6 Line - PPG 50801 - Devoe
22.	1.4	Finish Coat Semi-Gloss	Synthetic Alkyd Resin	Coronado Supercoat 5000 Speedhide Alkyd Lo-Sheen Enamel, 6 Line - PPG Velour Interior Alkyd Semi-Gloss Enamel - 26XX Devoe
23.	NA	Wood Filler	Alkyd Resin w/Linseed Oil	Paste Wood Filler - Negley Natural Paste Wood Filler - PPG Interior Solvent Base Paste Wood Filler 4800 - Devoe
24.	NA	Stain	Synthetic Alkyd Resin	Coronado Quick Seal Rez Interior Wiping Stain, Alkyd Oil Type, Quick Drying, 77-302 - PPG Penchrome DF203 - ICI Devoe
25.	1.0	Sealer/Primer	Synthetic Alkyd Resin	Rez Sealer-Primer, 77-1 - PPG
26.	1.5	Clear Finish, Satin	Polyurethane Varnish	Coronado Polyurethane 67 Series Rez Polyurethane Satin Clear Plastic Varnish, 77-89 - PPG DF500 - ICI Devoe
27.	1.5	Clear Finish, Gloss	Polyurethane Varnish	Coronado Polyurethane 67-10 Rez Exterior/Interior Polyurethane Gloss Clear Plastic Varnish, 77-55 - PPG
28.	5	Steel, Iron or Concrete Surface	Modified Amine-Addnet Epoxy	Polybrid 670S - Polybrid Coatings, Inc. (no “or equal”)
29.	40-120	Steel, Iron or Concrete Surface	Elastomeric Polyurethane Aromatic	Polybrid 705 - Polybrid Coatings, Inc. (no “or equal”)

*Or manufacturer’s standard, whichever is greater. Do not exceed manufacturer’s maximum standard, if applicable.

**For potable water use.

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SECTION 11311

IRRIGATION PUMP STATION

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the furnishing and installation of a packaged irrigation pump station as shown on PLANS and specified herein. The packaged irrigation pump station shall consist of two (2) variable frequency drive, vertical, self-priming, submersible well pumps, control panel, and interconnecting piping and valves, assembled and mounted on a single structural slab base. Design, fabrication, testing, and servicing shall be the responsibility of the pump irrigation station manufacturer.

B. The system, including submersible well pumps, motors, controls and appurtenances must be completely wired, assembled and tested as indicated and in compliance with Contract Documents prior to shipment.

C. Contractor is responsible for all details necessary to properly install, adjust, and place in operation a prefabricated skid mounted, fully automatic pumping system for irrigation.

1.02 RELATED REQUIREMENTS

A. PLANS show general arrangement, location, and basic dimensions. This Specification Section gives performance and design requirements.

B. Related work as called for on PLANS or specified in this or other TECHNICAL SPECIFICATION Sections.

1.03 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.

ASTM INTERNATIONAL (ASTM)

A 53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
D 1785	Standard Specification for PVC Plastic Pipe, Schedules 40, 80, and 120
D 2467	Standard Specification for PVC Plastic Pipe Fittings, Schedule 80
D 2464	Standard Specification of Threaded PVC Plastic Pipe Fittings, Schedule 80

AMERICAN WATER WORKS ASSOCIATION (AWWA)

C704-92	Standards for Propeller-Type Meters

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

MG-1	Motors and Generators Standard

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

9.8-1998	Pump Intake Design

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

B16 Standards of Pipes and Fittings

UNDERWRITER'S LABORATORIES, INC. (UL)

UL-508A Industrial Control Equipment, 'Governs the construction of control panels'

UL QCZJ Packaged Pumping Systems, 'Governs the manufacturer of pump stations'

1.04 (NOT USED)

1.06 SUBMITTALS

A. Furnish the following in accordance with Specification Section 01300, "Submittals" and Section 01730, "Operation and Maintenance Data."
   1. Product Data: Submit pump curves indicating total head, flow capacity, brake horsepower, efficiency, and NPSH required from shut-off to beyond minimum operating head at all operating speeds and priming lift capacity.
   2. Detailed shop and erection drawings, wiring diagrams, pump curves, motor data, parts lists, and motor power/control cable data. Include alarm and shutdown elevations as well as machine monitoring alarm and shutdown setpoints (as applicable) for submersible pumps for proper operation and protection.
   3. Descriptive literature, bulletins, and catalogs of the equipment included within this Specification.
   4. Full electrical schematic, including thee line power schematic, ladder logic, PLC and system interface.
   5. Dimensioned installation drawings, and construction material designations by ASTM Standards.
   6. Manufacturer's Installation Instructions.
   7. Manufacturer's Compliance Certificate.
   8. A list of 5 similar pre-fabricated irrigation pump station installations with Owner contact information.
   9. Copies of Ul authorizations under categories QCZJ/QCZJ7 and UL508A and CSA C22.2 No. 14.
   10. Certificate of conformance as required in Paragraph 1.07-Quality Assurance.

B. Operation and Maintenance Manuals shall include a complete set of general arrangement drawings, electrical power schematics and control schematics. O&M Manuals shall also include a complete description of the system including operation sequence, alarm sequence, receiving instructions, storage instructions, and control feature description.

C. Furnish certified report prepared by manufacturer's technical representative certifying satisfactory installation, operation, and in-service placement of units.

1.07 QUALITY ASSURANCE

A. All equipment under this section shall be furnished by a single supplier. The supplier shall have sole responsibility for the proper functioning of the system and equipment supplied, preparation of the required submittal data including operation and maintenance manuals, and technical supervision for installation and start-up of the equipment. Contractor is responsible for all details necessary to properly install, adjust and place in operation a working system.

B. Equipment specified shall be manufacturer's standard cataloged product and modified to provide compliance with the drawings, specification and the service conditions specified and indicated.

C. Manufacturer of shall have a minimum of ten (10) years manufacturing and application experience.

D. Manufacturer of specified equipment shall have a minimum of five (5) operating installations with equipment of the size specified and in the same service as specified operating for not less than five (5) years.

E. Comply with requirements specified in Specification Section 01400 “Quality Control Services”.

F. Provide fabrication in compliance with all applicable ASTM standards or equivalent international standards.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver to site undamaged.

B. Store above ground on platforms, skids, or other supports, and protect from corrosion and mechanical damage in accordance with the manufacturer’s recommendations and instruction. Protect electrical components from condensation. Flanges to be protected by wooden blank flange protectors, strongly built and securely bolted thereto, or otherwise attached.

C. Handle unit to prevent damage during unloading and installation. Follow manufacturer’s instructions on lifting and setting.

1.09 – 1.11 (NOT USED)

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. The irrigation pump station shall include two (2) submersible pumps with Variable Frequency Drives (VFD) controls capable of providing flow at 75 GPM at a Total Dynamic Head (TDH) of 196 ft at the discharge of the irrigation pump station skid for pumping raw lake water for irrigation use. The irrigation pumping system shall automatically maintain a constant discharge pressure regardless of varying flow demands within the station rating. All irrigation pump station components, except the submersible pumps and associated piping and isolation/check valves, to be skid mounted and shall arrive on-site wired and ready to operate. Prefabricated irrigation pump station package to include submersible pumps, skid suction and discharge piping, a discharge manifold and valves, an automatic filtration system, a flow meter, VFDs, a pump package control system, and associated appurtenances.

B. Service Conditions
1. Number of Pumps: 2
2. Flow Rate: 75 gpm
3. Operating Range Pressure: 85 psig (196 ft) at Irrigation Skid Discharge
4. Pump Cycle Time: 10 minutes (a maximum of 6 start/stop per hour per pump under actual load conditions)
5. Horsepower: 5-15 hp
6. Voltage: 230/460 V, 3 phase, 60 Hz
7. Pump Discharge Size: 3 inch
8. Maximum Skid Dimensions: 72”x 60”

C. Manufacturers
1. MCI Flowtronex
2. Or Owner/Engineer approved equal

D. CONTRACTOR is responsible for the design of the pipe support system. Reference Specification 15061.

2.02 MATERIALS AND/OR EQUIPMENT

A. Pump and Motor Requirements
1. Pump Type: Submersible, Goulds Model 160L07, or equal
2. Materials: AISI 304 SS and FDA Compliance non-metallic parts
3. Shaft Seal: Mechanical seal with Viton Rubber parts
4. Pump/Motor Shaft: AISI 304 Stainless Steel
5. Flow: 75 gpm
6. Head (at Discharge): 196 ft
7. Horsepower: 5 to 20 HP
8. RPM: 3400 to 3600 RPM
9. Voltage: 230/460V. 3 phase, 60 Hz
10. Materials: AISI 304 Stainless Steel, with reusable cable plug.
11. Impellers, diffusors, spacers, tie rods, strainer, shaft, shaft coupling and motor adapter shall be manufactured from AISI 304SS.
12. Elastomers: manufactured from EPDM
13. Shaft Sleeve and Bushing: Tungsten Carbide.
14. Thrust bearing: PTFE+Graphite
15. Motor shall be high efficiency submersible squirrel cage induction, inverter duty rated per NEMA MG-1 Part 31 and suitable for use with pule-width-modulated variable speed drive as specified in Section 13390 of Specifications.
16. Motor cable(s) shall be submersible service multi-conductor copper cable(s) provided in one continuous length from the pumping unit to the control panel. Manufacturer shall coordinate with the Contractor and provide the cable length required to meet the requirements of the PLANS. Cable termination at the motor shall be suitable for submersible service, installed, and sealed by the pumping unit manufacturer.
17. Pump(s) are to be engineered and manufactured under the certification of IS0-9001:2015.

B. Plumbing Requirements
1. Piping external to the skid shall be Schedule 80 PVC, meeting ASTM D 1785. Injection molded PVC Schedule 80 fittings shall conform to ASTM D 2467 and PVC Schedule 80 threaded fittings shall conform to ASTM D 2464. All piping shall be hydrostatically tested to 150% of maximum shutoff pressure.
2. Piping internal to the skid shall be steel, meeting ASTM A-53 Grade B pipe specification. Flanges will be 150 lb. Pipe shall be Schedule 40 or heavier for less than 8” diameter pipe. All piping shall be hydrostatically tested to 150% of maximum shutoff pressure.
3. Oversize Manifold: Pumps must discharge into an oversized pipe discharge manifold (12” minimum) located on factory assembled skid to minimize losses and eliminate air buildup. Minimum connections at the manifold shall include a ¾” hose bib connection, pump discharge entrances, exit pipe, pressure relief valve, and pressure gauge port.
4. Discharge Outlet: The discharge outlet of the system will be welded into the manifold and will have an ANSI 150 PSI flange for connection to the irrigation system.
5. Pump Check Valves: Pump check valves will be mounted a minimum of 4 pipe diameters from discharge output and will be of the wafer style silent operating type that will pass 100% of the pump volume. They will begin to close as velocity decreases and fully close at zero velocity. The valves will be rated at 200 PSI.
6. Pump Isolation Valves: Pump isolation valves shall be lug style butterfly valves for 2” and above with Lever handle. Valves shall be constructed of ductile iron. Valves shall be rated for 150 PSI operating pressure. Valve shall have aluminum bronze disc and stainless steel shaft.

7. Pressure Relief Valve: A pressure relief valve will be connected to the horizontal discharge manifold. This valve will be set at 150% of operating pressure. The valve will be quick opening and slow closing to minimize surging. The valve body will be cast iron and rated for 200 PSI. A strainer filter will be installed on the inlet side of the valve body to provide clean water to the pilot.
8. System Isolation Valve: A system isolation valve will be installed on the pump station discharge to isolate the pump station from the irrigation system. The valve will be equipped with a ten-position locking lever or gear operator. The valves will be rated 200 PSI.
9. Over-Temperature Protection: Provide a non-electric temp probe and purge assemblies for each individual pump.
10. Pressure Gauges: Pressure gauges shall be supplied for suction and discharge system pressures and shall be glycerin filled, steel bottom mounted and 0-200 PSI. Accuracy shall be within 1.5%. Gauges shall be 2-1/2" minimum with pressure ranges at least 30% higher than highest pressure attainable from pumps at shut off head conditions.

C. Filter Requirements
1. The filter shall be VAF Filter Model V250 or approved equal. It shall be constructed in general accordance with both ANSI and ASME codes. The filter shall be rated for service at 200 GPM, 150 psi at 200ºF with 100µm screen.
2. The filter body shall be made from stainless steel, 316L or carbon steel with fusion epoxy lining.
3. The filter shall have 3" x 3" inlet/outlet ANSI Flange and NPT female connections, once at the bottom (inlet) and on the side (outlet) 90º from the inlet on the side. One 1" N/C 1" opening shall have 3.0 sq ft screen area. The 316L stainless steel screen shall have 3 layers sintered mesh on Stainless Steel support. The backwash shall be accomplished in less than 6 seconds using 6 gallons of water with a radially and axially moving dirt collector and without interrupting main flow. The piston shall control the lateral movement of the dirt collector.
4. The backwash shall be triggered on a 7 psi differential pressure between the inlet and outlet. The backwash controller, shall have wet-wet differential pressure sensor, field adjustable timing resettable backwash counter. It shall have an alarm light remote alarm notification contact. If the differential pressure across the filter screen exceeds 10 psi, and the filter backwashes more than 3 times in two minutes the remote alarm notification contacts will change state.

D. Electrical Requirements

1. Packaged Control System shall receive a single point 480V, three phase, 60 Hertz, electrical service.
2. Provide the manufacturer's standard features for proper operation and protection of a packaged variable speed application irrigation pump station.
3. Where an OIU is provided, provide Programmable Logic Controller (PLC) bypass switch for emergency use to run pumps only without OIU consent.
4. Refer to and comply with the additional requirements as shown on the PLANS.
5. Equipment Interface: Provide all required devices and means to interface the packaged control system with the equipment as specified herein and as shown on the PLANS for a complete and functional system.
6. Heat exchanger to be mounted in control panel to remove heat generated from Variable Speed Drives.

E. Flow Meter
1. The Pump station shall have a flow sensor installed, which shall be utilized to display the pump station flow rate, and total flow rate at the pump station control panel. The flow sensor shall be per the manufacturer's recommendation for variable speed irrigation pump station application. Flow sensor accuracy shall be plus/minus 2% of actual flow rate between flow velocities of 1-30 ft/sec. Install per manufacturer's recommendations.

2. The Pump Station shall have a flow switch installed, which shall be utilized to activate the pump station on minimum flow rate, and start de-staging under no flow conditions.
3. The pre-fabricated irrigation skid manufacturer shall make available for remote monitoring the totalized flow and the real time flow rate data through the Ethernet data link connection that is required for this equipment.

F. Pressure Transducer
1. Pressure transducer shall be mounted on the discharge headers or control panel and shall provide all pressure signals for the control logic. Pressure transducer shall be a solid-state bonded strain gage type with an accuracy of +/- 0.25% and constructed of 316L stainless steel. Resolution of the transducer shall be greater than the resolution of the analog to digital conversion for PLC operation. Transducer shall be rated for pressures greater than station discharge pressure and shall provide gauge pressure output, rather than absolute pressure.

G. Variable Speed Drive
1. Two (2) variable speed drives will be provided sized of the appropriate horsepower per equal size of the main pumps. Furnish complete VFD as specified herein or in the equipment schedule for loads designated to be variable speed. VFD's shall be user-selectable for either constant or variable torque loads.
2. Reference requirements outlined in Specification Section 13390, "Package Control Systems".

H. Programmable Logic Controller
1. Processor utilizing battery for program storage will not be acceptable. Unit shall operate on 24 Vdx and shall include 750 KG user memory. The operating range of the processor shall be 32 to 140° F. PLC shall be provided with capability of using SD memory card for data logging. I/O shall be 24 Vdc. Processor shall be capable of expanding the I/O with the addition of up to 4 expansion modules. The processor shall be provided with the following on board I/O:
   a. 16 DC Inputs
   b. 16 DC Outputs
   c. 4 Analog Inputs current and voltage
   d. 5 Outputs require 4 discrete (120 Vac) signals and 1 Analog Signal
   e. 4 High speed Counters
2. Reference requirements outlined in Specification Section 13390, "Package Control Systems".

I. Safety
1. Low Discharge Pressure Shut Down: 25 PSI Below Setpoint
   a. Stop pumping system in the event discharge pressure drops below the normal level. Operator interface device, mounted in enclosure door, shall signal low discharge pressure. Pumping system shall not operate until safety has been manually reset.
2. High Discharge Pressure Shut Down: 15 PSI Above Setpoint
   a. Stop pumping system if discharge pressure reaches 15 psi above setpoint. Operator interface device, mounted in enclosure door, shall signal high discharge pressure. Pumping system shall not operate until pressure is reduced and alarm has been reset.
3. Low Water Level Shut Down
   a. Alarm shall be activated when level in the upper wet well reaches a critical low level. Alarm shall cause the pumps to be retired in an orderly manner. Alarm shall not be capable of being overridden. Alarm shall not allow any pumps to run, whether in the "PLC bypass" or the "Automatic" function of this selector switch until level has been restored and alarm

has been reset. Indication of the alarm shall be displayed visually on the control panel and capable of being output to SCADA.

4. Main phase failure and low voltage safety circuit shall retire the pumping system if it experiences low voltage, phase failure, or phase reversal as monitored at the line-side of control enclosure. Phase monitor shall have a time delay to allow for transient low voltage during motor starting and to allow maximum motor protection. Operator interface device, mounted in enclosure door, shall signal phase failure for any affected pump.
5. Individual phase failure and low voltage alarm circuitry, as part of the overload relay circuit, shall retire any pump that experiences low voltage, phase failure or phase unbalance as monitored at the load-side of each pump motor contactor by the overload relay. Each pump motor shall have its individual protective device and time delay to allow for transient low voltage during motor starting to allow maximum motor protection. The individual pumps or pumping system shall not operate until the voltage problem has been corrected and safety has been manually reset. Incoming phase monitor safety circuit as the only phase failure sensing device is not acceptable.

J. Skid Requirements
1. The base will be manufactured out of carbon steel with a 3/8" deck plate under the skid utilizing 4" and/or 6" channel construction to provide rigidity to withstand operations. All top plate welds complete (no skip welding). Provide handling hooks for craning the station into place. Easy bolt on pump assembly is designed into the base. SS, Zinc, or Cad plated hardware will be used to retard corrosion.

K. Coating Requirements
1. All components of the irrigation pump station system, except stainless steel to conform to the coating requirements in the Contract documents.

2.03 CONTROLS AND OPERATION

A. Control Panel
1. Reference requirements outlined in Specification Section 13390, "Package Control Systems".

PART 3 EXECUTION

3.01 INSTALLATION

A. Contractor is responsible for installation of a complete and operational system. Install submersible well pumps in accordance with the PLANS, approved shop drawings, and manufacturers installation instructions.

B. Mount all piping, valves, pumps, instruments, etc. as shown on PLANS and approved shop drawings. When instrument mounting details are not shown, mount instruments in an easily accessible position not lower than 3 feet nor higher than 5 feet above finished floor.

C. After completion of all installation procedures, clean and touch up any damaged coating as required.

3.02 FIELD TESTING

A. Following the Manufacturer's calibration of the instruments, the Manufacturer shall perform Component, System, and Operational Tests on the Irrigation Pump Skid System Equipment. It is the responsibility of the Manufacturer and Contractor to jointly coordinate and arrange the times for testing and startup activities; however, the Contractor must confirm that these times are acceptable to the Owner.

B. Testing and Placing in Service
   1. All final adjustments of equipment, controls, and instruments to be performed with assistance from technicians representing equipment manufacturer.
   2. Coordinate start-up with other phases of construction for project. Instruct operating personnel concerning operating and maintenance procedures.

C. Manufacturer's Services
   1. All final adjustments of equipment, controls, and instruments to be performed by technicians representing the equipment manufacturers. Furnish service training required in this Specification.

D. Field testing will not be conducted without an accepted procedure, calibration certificates for all testing equipment, and a completed and signed pre-testing check list provided by the Contractor

E. After completion of installation and prior to acceptance by the OWNER, CONTRACTOR shall demonstrate in the presence of the ENGINEER the functionality of both submersible pumps.
   1. Test 2 hours minimum for flow and head at the rated condition of each submersible pump by slowly ramping each pump up. After the 2 hour test for one pump, slowly ramp down that pump and switch over to the second submersible pump and repeat. Additionally, test for flow and head at 25 percent below the rated flow and at 10 percent above the rated flow for each submersible pump, each for 15 minutes.
   2. Performance Test shall include draining the Upper Wet Well to ensure that the low-level float alarm is functional.
   3. Performance test shall include a manual triggering of the backwash cycle.
   4. During tests, observe and record the flow rates, pressure readings, upper wet well depths and make observations on noise levels.
   5. The Irrigation Pump Skid System must demonstrate seven (7) days of continuous, defect-free operation prior to final acceptance.

3.03 SYSTEM STARTUP

A. When discharge piping, electrical connections, and electrical inspection have been completed the pump station manufacturer shall be contacted for start up. Provide one-week notice to OWNER prior to scheduled start up date. During start up, the complete pumping system shall be given a running test of normal start and stop, and fully loaded operating conditions. During this test, the system shall demonstrate its general ability to operate without undo vibration or overheating, and shall demonstrate its general fitness of service. All defects shall be corrected and adjustments shall be made for proper operation. After station startup has been completed, a training session shall be given to the OWNER familiarizing the OWNER with the pumping system operations, maintenance and adjustments. Minimum start up assistance, exclusive of travel time shall be one 8-hour day. Provide for minimum of an 8-hour training session, exclusive of travel time, in addition to the start up assistance. Start up and training assistance shall be by the pump station manufacturer's technical service agent

3.04 – 3.10 (NOT USED)

3.11 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this section. Include cost of same in contract price bid for work of which this is a component.

END OF SECTION

SECTION 11327

MECHANICAL SCREENING SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Furnish and install front cleaned mechanically cleaned bar screen(s) with multi-rake blades as shown on PLANS and as specified herein. Each unit to consists of bar rack, discharge chute, side frames, covers, rake blades, drive chains, scraper assembly, drive motor, anchor bolts, debris hopper, associated controls and all accessories and appurtenances required for a complete and properly operating installation.

B. Test mechanically cleaned multi-rake screens, gear reducers, motors, controls and appurtenances as indicated and in compliance with Contract Documents.

1.02 RELATED REQUIREMENTS

A. PLANS show general arrangement, location, and basic dimensions. Attachment “A” to this Specification Section gives performance and design requirements.

B. Related work as called for on PLANS or specified in this or other TECHNICAL SPECIFICATION Sections.

1.03 REFERENCES

A. American Federation of Bearing Manufacturers Association (AFBMA)

B. American Gear Manufacturers Association (AGMA)

C. American Iron and Steel Institute (AISI)

D. American National Standards Institute (ANSI)

E. American Society for Testing and Materials International (ASTM)

F. American Welding Society (AWS)

G. National Electrical Manufacturers Association (NEMA)

H. Steel Structures Painting Council, American National Standards Institute (SSPC)

I. Underwriters Laboratory (UL)

1.04 SUBMITTALS

A. Submit the following shop drawings in accordance with Specification Section 01300, “Submittals”:
   1. Certified shop and erection drawings showing important details of construction including dimensions, anchor bolt locations, and field connections. General

arrangement drawings, plan and section showing bar rack, rake blades, chutes, supports and all process equipment interfaces. Contractor shall submit electronic files of the proposed equipment in the capacity, size, and arrangement as indicated and specified.

2. Descriptive literature, bulletins, and catalogs of the equipment, including details of the motor, gear reducer, and lubrication points.
3. Drawings showing materials of construction, thicknesses, operating and maintenance envelope and assembly weight.
4. Drawings showing dimensions and weight of screen equipment components that are to be assembled on site.
5. Installation, operation, and start-up procedures, including details of the motor, gear reducer and lubrication points.
6. Equipment weight, including the weight of the single largest item, and lifting points for installation and removal purposes.
7. Motor manufacturer's data sheets and drawings. Motor shop test results.
8. Schematic control and power wiring diagrams including interconnecting and internal wiring diagrams.
9. Control panel drawings.

B. Furnish in accordance with Specification Section 01730, "Operation and Maintenance Manuals":
   1. Operating and maintenance instructions and parts lists. A list of recommended spare parts other than those specified. Predicted life of parts subject to wear.

C. Installation Report:
   1. Furnish copies of certified report prepared by Manufacturer's technical representative certifying satisfactory installation, operation, and in service placement of units.

1.05 SPARE PARTS

A. Provide spare parts that are identical to and interchangeable with similar parts installed.
   1. Furnish following spare parts for each screen:
      a. One (1) wiper blade.
      b. Six (6) replacement chain strands.
      c. One (1) set of upper and lower sprockets.
      d. One (1) proximity switch.
      e. One (1) rake teeth assembly (each assembly shall provide one complete rake tooth replacement).
   2. One set of all special tools required.

1.06 QUALITY ASSURANCE

A. Comply with the requirements specified in Specification Section 01400, "Quality Control Services".

B. Equipment specified shall be the product of a single manufacturer.

C. The Contractor shall obtain the screens, gear reducers, motors and appurtenances from the mechanically cleaned multi-rake screen manufacturer, as a complete and integrated package to insure proper coordination and compatibility and operation of the system. Contractor responsible for all details necessary to properly install, adjust, and place in operation complete working system.

D. Equipment specified shall be manufacturer's standard cataloged product and modified to provide compliance with the drawings, specifications and the service conditions specified and indicated.

E. Screen will be fully assembled and run tested to confirm fit and function of the screen. A certificate of the shop run test shall be supplied with the shipping documents.

F. Manufacturer of specified equipment shall have a minimum of five (5) operating installations with equipment of the size specified and in the same service as specified operating for not less than five (5) years.

G. If equipment proposed is heavier or taller, different width, or discharge arrangement than specified and indicated; provide all structural, architectural, mechanical, electrical and plumbing revisions at no additional cost to the Owner.

H. Provide fabrication in compliance with all applicable ASTM standards or equivalent international standards.

1.07 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver to site undamaged.

B. Storage: Store above ground on platforms, skids, or other supports, and protect from corrosion and mechanical damage in accordance with manufacturer's recommendations and instruction. Protect electrical components from condensation.

C. Handling: Handle unit to prevent damage during unloading and installation. Follow manufacturer's instructions on lifting and setting.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Screening system capacities and operating data are indicated in Attachment "A" to this Specification Section.

B. The screening system shall positively capture and remove debris from the incoming raw water by means of a bar rack, installed in a concrete channel designed to retain debris. A traveling raking mechanism removes and elevates the debris to a discharge wiper mechanism. The bar rack shall be cleaned by multiple rakes engaging the upstream side of the bar rack from the bottom of the channel and removing the debris. Screen designs that rely on the upward travel of the rake drive to pull the rake over an obstruction are not acceptable.

C. Screenings debris shall be lifted above the top of the channel and discharge through the downstream side to a debris collection bin as indicated. 100 percent of screenings debris on each rake shall be transferred from the rake to the discharge chute.

D. The screen shall be designed and built to withstand maximum possible static hydraulic forces exerted by the liquid to the screen. Provide a screen capable of operating with the screen 50 percent blinded and structurally capable of 100 percent blinded. All structural and functional parts shall be sized to prevent deflections or vibrations that may impair the screening operations.

E. The screen shall be fully enclosed above the channel level with bolted front and rear covers. Covers shall have doors or sections that can be opened or removed without having to undo bolts/nuts.

F. Design unit's cleaning cycle to be initiated and controlled by local automatic control based on differential headloss or by manual hand switches.

G. The Contractor shall coordinate the details, dimensions, and operating requirements of the screening system, including the debris hoppers and overhead bridge cranes, in order to effect an arrangement that will provide a safe and efficient means for handling screenings. To this end, the actual dimensions and arrangements as shown may vary, if required, to improve operations.

2.02 MANUFACTURERS

A. Mechanical Screening System:
   1. SAVÉCO North American, Inc.
   2. Vulcan Industries, Inc.
   3. HUBER Technology, Inc.
   4. Or Owner/Engineer approved equal

2.03 EQUIPMENT

A. Frame Assembly
   1. The framework of the screen shall be constructed of type 304 stainless steel. The frame shall be designed to support all required loads.
   2. The side frames shall be 304 stainless steel plate minimum 5/32-inch thickness formed to a channel profile, with a minimum width of 20-inches and extend fully from the bottom of the channel to the top of the bar screen assembly. The side frames shall be attached to a flush bottom base plate manufactured of 304 stainless steel plate, having a minimum thickness of 5/32-inch. The frame shall have a minimum of two support beams on the front above the maximum water line. No braces, gussets or stiffeners shall be inside the Screen Frame that will allow for Screenings to collect.
   3. Chain guide shall be securely bolted to the screen frame for the full height of travel and shall not protrude into the flow. The chain guide shall accurately align the rake teeth immediately into the screen bars starting at the bottom of the bar field and maintain positive engagement in the bar rack field. The chain guides shall be manufactured of 3" x 1-1/4" x 10-gauge 304 stainless steel.
   4. The screen shall be mounted on a pivoting stand fastened to the top of the deck as shown in the PLANS. The screen pivoting mounting system shall allow the screen to pivot without dewatering the channel. The screen pivoting mounting system shall be constructed of 304 stainless steel and complete as required to function in accordance with the specification.
   5. The side frames shall be provided with precision bolted splices as required for transportation and installation into the screening facility. The splices shall consist of 1/4-inch thick 304 stainless steel plates matching the side frame profile. The splice plates and side frames shall be manufactured with mating holes that shall allow the frame sections to be securely fastened together in the field. The quantity and location of side frame splices shall be coordinated between the Manufacturer and the installing Contractor.

B. Bar Rack
   1. The bar screen shall be provided with a removable bar rack constructed of 304 stainless steel. The bar rack shall consist of straight bars having 30mm clear

spacing between each bar, equally spaced and inclined from the horizontal as indicated.

2. The bar rack shall extend from the base plate to the connection point on the dead plate. Screens with bars welded or bolted in place are not acceptable.
3. The bottom of the bar rack shall be provided with extended curved parallel bars, which shall allow each raking mechanism to engage the bottom most portion of the bar rack prior to reaching the inclined section of the rack. Curved plate may be substituted for curved bars.
4. The lower base plate and bar rack design shall allow solids to be picked from the bottom of the base plate and allow immediate engagement into the lower portion of the bar field. Designs that do not allow for positive immediate engagement to the bar field are not acceptable. Provide the bar rack extending the full depth of the channel.
5. Bar racks requiring a recess in the bottom of the flow channel shall not be allowed.

C. Rake and Chain Assembly
1. The rake drive chains shall be equal in pitch to the upper drive sprockets and the lower guide sprockets. The chain for the rakes shall be roller type chain constructed of type 304 stainless steel. Rollers shall be 304 stainless steel. Pins shall be hardened stainless steel. Chain shall have a maximum design operating force of 24,000 lbs.
2. Drive chains, chain guides, sprockets and their bearings shall be replaceable without removing the screen from the channel. Chain shall not require lubrication.
3. Each screen shall be provided with sprockets a minimum 25 mm thick with 125 mm pitch from 304 stainless steel. Sprocket pitch and width shall match the roller chain.
4. Upper drive shaft bearings shall be grease lubricated take up bearing. The take up screw shall be an acme thread type from type 18-8 stainless steel. The casing shall be made of paint coated cast iron.
5. Lower bearings shall be proven self-lubricating fiber reinforced PTFE material and shall be maintenance free. A ceramic or hardened steel collar shall be bonded onto the stub shaft. No lower bearing requiring lubrication shall be allowed.
6. Rakes shall be designed to lift the screenings removed from the bar rack to the discharge point. The rake blades shall have teeth precision cut from a single continuous bar of type 304 stainless steel with 1/2-inch thick rake teeth/bar and 1/4-inch thick reinforcement profiles. Teeth shall engage into the bar rack a minimum of 50% of the bar depth. Rakes shall be provided with a shelf of shovel shape to contain the collected screenings and prevent them from falling back into the channel. Rake teeth shall meet the bottom curved base to ensure removal of solids from the channel invert and shall then immediately positively engage the bottom of the bar screen grid. Screens that allow the rakes to float and jump over debris shall not be allowed. Each rake head shall have a minimum carrying capacity of 0.25 cu ft./ft. of rake head width.

D. Dead Plate
1. The bar screen shall be provided with minimum 5/32-inch thick type 304 stainless steel fixed dead plate extending from the upper portion of the bar rack to the screenings discharge point.
2. The head of the rake teeth shall transition to a dead plate. Rake teeth shall closely follow the dead plate riding no closer than 1/32-inch and no further than 1/4-inch from the dead plate. Dead plate shall be securely bolted to the side frames with no gaps.
3. Designs in which the dead plate does not extend to the point of discharge shall not be allowed.

E. Discharge Chute
1. A discharge chute enclosure shall be provided.
2. Discharge chute enclosure shall not extend beyond the end of the discharge chute and shall not prevent overhead access to or vertical removal of the debris hopper.

3. The discharge chute shall be mounted to direct screenings into the debris hopper. The chute shall have a slope of minimum 45 degrees. The discharge chute shall be made of a minimum 1/8-inch thick 304 stainless steel plate.

F. Wiper Assembly
   1. A pivoting wiper mechanism shall be positioned at the point of discharge and shall be attached to the side frames and fully contained inside the framework of the screen. The scraper, excluding the wiper blade, shall be constructed of type 304 stainless steel. The wiper blade shall be manufactured of UHMW-PE and shall be replaceable.
   2. During each cycle, the wiper blade shall contact the rake heads at its inner surface during upward travel and shall scrape the debris off the end of the rake head and through the discharge chute. The wiper shall be designed such that screenings do not wrap around the rake or wiper. Wiper shall allow the rake assembly to operate in reverse without the need to manually lift the wiper assembly.
   3. Shock absorbers shall be provided to cushion the release of the wiper if required by the manufacturer.
   4. The grease fittings for the wiper arms shall be extended and secured to the side frames in an area where they can be easily accessed by facility personnel.

G. Frame Enclosure/Cover
   1. The screen shall be provided with removable, stiffened covers made of minimum 20-gauge thickness 304 stainless steel on the upstream portion of the bar screen above the operating floor held in place by latches. Covers shall be provided with minimum two handles per cover panel. All handles and latches shall be 304 stainless steel.

H. Drive Assembly
   1. The drive gear reducer and motor shall be mounted on the drive shaft and the frame. The drive shaft shall be from steel and be mounted between greaseable bearings mounted on the external side of the frame.
   2. The screen shall be provided with a helical worm gear reducer. Gear reducer shall have ball or roller bearings throughout with all moving parts immersed in oil. Gear reducers which require periodic disassembly of the unit and manual re-greasing of bearings are not acceptable. The nominal input power rating of the gear reducer shall be at least equal to the nominal horsepower of the drive motor. Gear reducer shall be designed and manufactured in compliance with applicable AGMA or equivalent standards.
   3. The rake assemblies shall be driven by an electric motor. The motor shall be UL rated for operation in the specified installation environment. The motor shall be a minimum 1.0 HP, TEFC, 460 Volts, 60 Hz, 3-phase, with a service factor of 1.15. Motor shall be inverter-duty rated for continuous use with VFD and have a Class B Temperature rise. The motor enclosure shall be rated for Class 1 Div. 2 and for operation in a 104º F environment.
   4. The screen shall automatically reverse and self-clean upon detection of a jam condition. A true power monitor controller shall be mounted in the screen control panel to detect and monitor the force generated by the gear reducer and when the force exceeds the high torque set point the screen shall be in jam mode. Alternately, control logic shall be included within the VFD to provide overload protection in case of a jam condition. Jam mode will cause the screen to enter the self-cleaning mode. The screen shall automatically stop and run in reverse for the time value entered into the control panel. The screen shall then stop and run forward. If the cause of the jam condition is cleared the screen will resume normal operation. If the jam condition is detected again the reversing cycle shall repeat itself up to four (4) times. If the self-cleaning mode should prove unsuccessful then the screen shall stop and the control system will initiate an alarm signal.

5. The torque link assembly shall consist of a drive unit mounted to a stainless steel arm. The stainless steel arm shall be held in place by a flanged roller bearing connected to the drive shaft and two heavy duty tension springs. The flange bearing shall be connected to the torque link by four bolts. The rocker arm shall be maintained in the standard operating position by the two tension springs. If the screen rakes experience a jam, the force will cause the torque link to rotate around the drive shaft, compressing one of the tension springs. This motion shall be limited by a rocker guide. When the torque link rotates out of the normal operating position a proximity sensor will send a signal causing the motor to enter the self cleaning mode. If the self cleaning mode should prove unsuccessful then the system shall initiate an alarm signal.
6. Chain drives, belt drives, and hydraulic drives will not be accepted.

I. Level Detector
1. Provide for each screen a VEGA radar differential level controller or equal for start and high-level sensing. A 120VAC controller shall be provided in a NEMA 4X wall-mounted enclosure. The controller shall be installed in a non-hazardous area. The radar level sensors shall be rated for installation in a Class 1, Div. 1/Div. 2 area. Each sensor shall have a measuring range of 15m and be supplied with a 10m integral cable. The radar level sensors shall be supplied with mounting brackets constructed from type 304 stainless steel. The radar level sensors shall be mounted at a location clear of the mechanical screen at any position along the mechanical screen's pivoting range.
2. For each screen provide one (1) float switch mercury free type of chemical resistant polypropylene construction for backup high level sensing. The float shall have an integral 20 foot cable and be supplied with a mounting bracket constructed from type 304 stainless steel. The float and bracket will require a suitable length of 1" pipe supplied by the contractor to suspend the float in the channel.

J. Proximity Switches
1. A NEMA frame mounted end of travel proximity switch to allow parking of the rake heads following completion of the cleaning cycle and to count rake cycles.
2. Proximity switch shall be single pole, double throw (SPDT) and rated not less than 10 amps at 120 volts AC.

K. Debris Hopper – Lower Screen
1. Furnish one (1) debris hopper, Jesco Rotator Box or approved equal, with an overall size of 48"L x 46"W x 42"H.
2. Debris hopper shall be equipped with four (4) lifting lugs, a set of two (2) fixed steel casters with a minimum diameter of 6 inches, a set of two (2) swiveling steel casters with a minimum diameter of 6 inches, and a three-way forklift access base.
3. Debris hopper shall be constructed of steel and have a minimum rated weight capacity of 4,000 pounds.
4. Debris hopper shall be coated per Specification Section 09902, "Paint and Protective Coatings", or per manufacturer's recommendation.
5. Furnish one (1) wire rope sling 4-leg 3/8" 6x19 construction IWRC with a minimum rated capacity of 4 tons at 45 degrees compliant to OSHA 29 CFR 1910.184 and ASME B30.9, including chain and hooks that are compatible with the debris hopper's lifting lugs and the existing bridge crane hoist's grab link. Length of wire rope sling lengths shall be coordinated with debris hopper for a maximum height of 66 inches from the bottom of the debris hopper to the hoist hook.
6. Furnish debris level sensor in accordance with Article 2.03/M.

L. Debris Hopper – Upper Screen

1. Furnish one (1) debris hopper, Jesco Rotator Box or approved equal, with an overall size of 60”L x 54”W x 36”H.
2. Debris hopper shall be equipped with four (4) lifting lugs, a set of two (2) fixed steel casters with a minimum diameter of 6 inches, a set of two (2) swiveling steel casters with a minimum diameter of 6 inches, and a three-way forklift access base.
3. Debris hopper shall be constructed of steel and have a minimum rated weight capacity of 4,000 pounds.
4. Debris hopper shall be coated per Specification Section 09902, Paint and Protective Coatings”, or per manufacturer’s recommendation.
5. Furnish one (1) wire rope sling 4-leg 3/8” 6x19 construction IWRC with a minimum rated capacity of 4 tons at 45 degrees compliant to OSHA 29 CFR 1910.184 and ASME B30.9, including hooks and link that are compatible with the debris hopper’s lifting lugs and the existing bridge crane hoist hook. Length of wire rope sling lengths shall be coordinated with debris hopper for a maximum height of 100 inches from the bottom of the debris hopper to the hoist hook.
6. Furnish debris level sensor in accordance with Article 2.03/M.

M. Debris Level Sensors
1. For each screen, furnish one (1) microwave barrier level sensors for debris level detection, VEGA VEGAMIP R61/T61, 120VAC and 3A with DPDT relay, or approved equal.
2. The microwave barrier level element and indicating transmitter instrument shall consist of a level indicating transmitter, a remotely-mounted emitter element, a remotely-mounted receiver element, and a programmable logic controller (PLC).
3. Unless otherwise specified, all instrument mounting channels, pipes, pipe caps, etc. shall be Type 316 stainless steel; also, all hardware connecting and securing the mounting hardware and instruments such as nuts, bolts, instrument tubing Cush-A-Clamp Assembly Pipe/Tube Clamp etc. shall be Type 316 Stainless Steel. Debris level elements shall be mounted 3-inches above the top of the debris hopper wall, or as recommended by the manufacturer.
4. All field mounted sensor/control/instrument devices shall be permanently identified. The device designations shall agree with those shown on the PLANS. Each device shall be provided with permanent type identifying nameplate. Nameplates, unless otherwise specified, shall be shaped as a circle and shall be constructed of 3-ply “White-Black-White” laminated phenolic material having engraved letters approximately 1/4 inch high extending through the white face into the black layer. Securely hang nameplates from each sensor/control/instrument device by a flexible stainless steel snap-on type hanger/key-chain cord (neatly drill a hole through the top of the identification nameplate for this purpose).
5. Nameplates:
    a. Type: 3-ply, 1/8” thick, rigid thermoset phenolic resin laminated cellulose paper base engraving stock per ASTM D-709, Type I. Nameplates shall be ASTM Grade ES-1, ES-2, or ES-3 as applicable for the face and lettering colors specified hereinafter. Flexible or acrylic tags will be not be accepted.
    b. Color: White-Black-White
    c. Lettering: 1/4 inch height, minimum, engraved through the face layer to the melamine middle layer.
    d. Accessories: Provide holes for mechanical fastening.
    e. Attachment Means: Securely hang nameplates from each sensor/control/instrument device by a flexible stainless steel snap-on type hanger/key-chain cord (neatly drill a hole through the top of the identification nameplate for this purpose).

6. Refer to Specification Section 16150 “Raceways, Fittings, and Supports” for instrument support channel system requirements.
7. Make all final connections and terminations per the instrument manufacturers’ recommendations.
8. Provide manufacturer’s services to perform start-up and calibration/verification.
9. Verify factory calibration of all instruments in accordance with the manufacturer’s instructions. Return factory calibrated devices to the factory if they do not meet the field verification requirements for calibration.
10. Field Configuration Capability:
    a. The level instrument shall have keys/buttons on the face of the instrument as required for the basic start-up and configuration of the unit.
    b. Provide additional instrument manufacturer software and associated instrument manufacturer hardware and/or computer interface cable for field programming of instrument from a computer or other digital device for instrument start-up and measurement optimization.
    c. Debris level sensor output shall be relayed to a designated PLC that shall be installed within the mechanical screens’ Main Control Panel enclosure.

2.04 CONTROLS

A. Main Control Panel
1. The control system shall be designed and manufactured by the bar screen manufacturer.
2. Contractor to furnish and install a dedicated packaged control panel for each bar screen. Control panel shall be contained in NEMA 4X stainless steel enclosure. Control panel shall include equipment controls, starters, and MCC, if required. Location of main control panel as shown on Electrical and Instrumentation & Control Drawings. Control panel shall be provided in accordance with Specification Section 13390, "Packaged Control Systems".
3. Design: Factory-wired and tested control panel designed to function with equipment. For each individual item, control panel functions as defined on the Electrical and Instrumentation & Control Drawings.
4. Panels materials and design to be specifically selected for durability and corrosion resistance.

B. Field Control Station
1. Contractor to furnish and install field control station for each item of equipment as defined in Attachment “A”, and on the Electrical and Instrumentation & Control Drawings.
2. Panel shall be designed to meet all NFPA 820 area classification requirements. Panel shall be provided that satisfies all classification requirements.
3. Field control station shall be per Specification Section 16540, "Field Control Stations".

2.05 OPERATION

A. Screen Hand Operation: In HAND position the operator shall be able to run the rake assembly by selecting the respective FORWARD-OFF-REVERSE selector switch. Turning the screen selector switch to Off will stop the unit.

B. Screen Automatic Operation: In AUTO position the screen shall be controlled by the water level sensors. Screen operation shall be started when the water level sensors monitor a certain water level difference, when the sensor senses high upstream water level or high differential, when the float switch senses high upstream water level, or when a certain time has passed since the last operation of the screen. Screen operation shall be stopped with

an adjustable delay time after the water difference is below a certain value and after the sensor reads the correct water level, or after a certain run time has expired (if operation was started by timer).

C. Fault Conditions:
   1. If the panel mounted true power monitor controller, VFD, or mechanical overload system detects a high torque condition (jam), the screen shall automatically stop and run in reverse for the time value entered into the control panel. The screen shall then stop and run forward. If the cause of the jam condition is cleared the screen will resume normal operation. If the jam condition is detected again the reversing cycle shall repeat itself up to four (4) times. If the self-clearing mode should prove unsuccessful then the screen shall stop and the control system will initiate an alarm signal.
   2. Reset is manually performed after correction of any cause for a trip-out.

2.06 ANCHORAGE AND FASTENERS

A. Anchor Bolts: All anchor bolts shall be a minimum of 1/2 inch diameter and made of type 304 stainless steel. The equipment supplier shall furnish all anchor bolts, nuts, and washers required for the equipment.

B. Fasteners: All fasteners shall be type 304 stainless steel. The equipment supplier shall furnish all fasteners required for the assembly of the equipment.

2.07 PROTECTIVE COATINGS

A. Stainless steel and plastic components shall not be coated. The stainless steel structural components shall be passivated per the methods described in ASTM A380-99, after fabrication to remove embedded iron, surface rust and weld burn.

B. All other surfaces shall be solvent cleaned to remove dirt, oil and foreign materials. Cleaned surfaces shall be coated in accordance with Specification Section 09902. Selection of finish coat color shall be coordinated with Owner, unless otherwise specified.

C. Non-stainless steel controls panels shall have Manufacturer's standard paint finish.

D. Provide additional shop paint coating for touch-up to all surfaces after installation and testing is completed and equipment accepted.

PART 3 EXECUTION

3.01 INSTALLATION

A. Follow manufacturer's and supplier's instructions and approved shop drawings for installation of equipment.

B. After alignment is correct, grout using high grade non-shrink grout.

C. Lubricate and make unit ready for operation.

3.02 FIELD TESTING

A. Testing and Placing in Service

1. All final adjustments of equipment, controls, and instruments to be performed with assistance from technicians representing equipment manufacturer.
2. Coordinate start-up with other phases of construction for project. Instruct operating personnel concerning operating and maintenance procedures.

B. Manufacturer's Services
   1. Manufacturer's technical representative to assist in the following services:
      a. Checking installation of units.
      b. Testing and adjustment of screen mechanism.
      c. Instruction of OWNER's personnel in the operation and maintenance of screens.

C. Field testing will not be conducted without an accepted procedure, calibration certificates for all testing equipment, and a completed and signed pre-testing check list.

D. After installation of equipment, and after inspection, operation, testing and adjustment have been completed by the manufacturer's field service technician, conduct a dry running test and a performance test for each unit in presence of the Owner or Owner's Representative to determine its ability to deliver its rated capacity under specified conditions.
   1. Dry Testing:
      a. Conduct test of each screen to simulate a blockage in the screen and to test the attempt to clear the blockage. Use the test to adjust the trip setting of the device. Testing shall use simulated signals per electrical and I&C specifications.
      b. Modified anchor bolts supplied by the equipment manufacturer shall be bolted to the screen bars for the test. The anchor bolting arrangement shall be suitable for the loads applied and simulate solids jamming the screen bars. A suitable means determined by the equipment manufacturer and acceptable to the Owner shall be employed to measure the load developed by the drive mechanism upon encountering the simulated blockage. Use the measured load to adjust the trip setting based on the recommended setting provided by the equipment manufacturer in advance of the test.
      c. Make all necessary adjustments and settings to the drive mechanism and tripping device at the time of the test to ensure that the mechanical bar screen rakes will stop at the appropriate trip setting, reverse direction of travel for the appropriate distance, and then resume forward travel three times when the blockage is encountered, and will stop the screen at the fourth attempt and generate an alarm.
      d. Perform a dry test on each mechanical bar screen to demonstrate the correct alignment, smooth operation, proper and equal spacing of screen bars, freedom from vibration, excessive noise and overheating of the moving parts and bearings.
      e. Perform a dry test on each screen to demonstrate the ability of the screen to successfully handle large objects of the size and weight occasionally encountered in unscreened stormwater.
      f. Perform a dry test on each screen to demonstrate the ability of the screen to successfully and completely clear each rake of all screenings debris.
      g. All defects recorded during the above field tests and all defects and failures occurring within the first year of operation shall be corrected at no additional cost to the Owner.
   2. Performance Testing:
      a. During tests, observe and record flow rates, channel water depths, headloss, and motor inputs.
      b. Test Duration: Determined by the Owner or Owner's Representative, but not less than ten cycles.

c. Each screen must demonstrate seven (7) days of continuous, defect-free operation prior to final acceptance. If operation is interrupted before completing the seven (7) days, the demonstration must be restarted once issues are resolved.
d. Immediately correct or replace all defects or defective equipment revealed by or noted during tests at no additional cost to the Owner.
e. Record the date and time of starts and stops in a log and provide updated logs to the Owner.
f. Repeat tests until specified results are obtained.

E. Make all adjustments necessary to place equipment in specified working order at time of above tests.

3.03 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

ATTACHMENT "A"

GENERAL DESIGN AND PERFORMANCE REQUIREMENTS

A. The screen system shall be installed in channels.

B. Design Requirements:

Screen Designation	MS-001 (UWW)	MS-002 (LWW)
Number of Units	1	1
Peak Hourly Flow	13.3 cfs	26.4 cfs
Flow Channel Width	4'-0"	4'-0"
Flow Channel Depth	7'-0"	7'-0"
Discharge Height EL.	489.50'	435.00'
Top of Screen EL.	Max 494.00'	n/a
Operating Deck EL.	486.00'	431.00'
Channel Top EL.	477.00'	431.00'
Channel Invert EL.	470.00'	424.00'
Bar Rack Spacing	30 mm	30 mm
Rake Speed	Min 10 feet/min	Min 10 feet/min
Rake Spacing	5 to 7 feet	5 to 7 feet
Rake Capacity	Min 0.75 cubic feet per rake	Min 0.75 cubic feet per rake
Setting Inclination	85 degrees from horizontal	85 degrees from horizontal
Field Control Station (FCS)	No	Yes
Other Features	Pivot Stand Mount Float Switch (High Upstream Water Level EL = 476.00) Torque Link Overload Protection System	Pivot Stand Mount Float Switch (High Upstream Water Level EL = 430.00) Torque Link Overload Protection System

C. Drive Motor Data:

1. Minimum Horsepower: 1.0 HP
2. Voltage: 460 volts, 3-phase, 60 Hz
3. Enclosure: TEFC severe-duty, rated for Class 1 Div. 2 environment

END OF SECTION

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SECTION 13390

PACKAGED CONTROL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Scope of Work
   1. Furnish, install, and place in service the packaged control systems as shown on the PLANS and as specified hereinafter.
   2. The subsequent document entitled “Appendix A – Packaged System PLCs Programming Criteria” is hereto made part of this section and includes OWNER’S requirements associated with the programming of the packaged control system PLC(s) and other project requirements. Coordinate with the OWNER’S and comply with the OWNER’S latest programming requirements. The contents of “Appendix A” are not inclusive of all requirements of this Contract. Refer to the PLANS and other Sections of the Specifications for additional information
   3. The subsequent document entitled “Appendix B – Host Pack Spreadsheets” is hereto made part of this section and includes OWNER’S requirements associated with the Host Pack spreadsheets. Coordinate with the OWNER and comply with the OWNER’S latest Host Pack spreadsheet requirements. The contents of “Appendix B” are not inclusive of all requirements of this Contract. Refer to the PLANS and other Sections of the Specifications for additional information.
   4. The subsequent document entitled “Appendix C – Software Tagging Criteria” is hereto made part of this section and includes OWNER’S requirements associated with the software tagging within PLC/OIU programs. Coordinate with the OWNER and comply with the OWNER’S latest tagging criteria requirements. The contents of “Appendix C” are not inclusive of all requirements of this Contract Refer to the PLANS and other Sections of the Specifications for additional information.

1.02 RELATED WORK

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the CONTRACTOR’s responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR’s Work.

C. Related work as called for on the PLANS, as specified herein or in other Sections of the Specifications.

1.03 QUALIFICATIONS

A. Panels associated with the Packaged Control System (PCS) shall be designed, constructed, and tested in accordance with the latest applicable requirements of ISA, NEMA, ANSI, UL, and NEC standards. Panels shall be designed, constructed, and tested by a UL508 certified entity.

B. Assemble panels in equipment manufacturer's factories. Test panels for proper operation prior to shipment from the manufacturer's factory.

1.04 DELIVERY, STORAGE AND HANDLING

A. Protection
   1. The Contractor, and hence the PCS supplier, shall be responsible for safety of the PCS during storage, transporting and handling.
   2. The PCS equipment shall be environmentally protected and stored in climate controlled (temperature and humidity, etc.) environment.
   3. At all times the PCS equipment shall be housed inside a moisture free, non-porous, extra heavy duty plastic weatherproof housing.
   4. Interior and exterior of PCS equipment shall be kept clean at all times.
   5. Energize the space heaters within the PCS and energize during storage and installation for humidity control.

B. Additional project job site storage requirements: Upon delivery to the project site and prior to final installation, protect and store in accordance with the following:
   1. Environmentally protected and stored in climate controlled (temperature, humidity, and non-corrosive class) environment at the job site. Size, furnish and install temporary gaseous air scrubbers, air conditioners, and additional environmental control equipment complete with branch circuiting conduit/wire as required to maintain in a controlled environment at the following conditions:
      a. Ambient Dry Bulb Temperature:
         1) Minimum: 68 degrees Fahrenheit.
         2) Maximum: 85 degrees Fahrenheit.
      b. Ambient Relative Humidity: Maximum: 50%.
      c. Ambient Corrosion Level: International Society of Automation Class: G1
   2. Every effort shall be made to provide all necessary electrical power connections ready for immediate connection to equipment upon arrival of equipment on jobsite.
   3. Upon arrival of equipment onto job site, the Contractor shall provide proper transition of power to equipment, especially any 120 VAC powered equipment, to ensure all air conditioning, heating, and gaseous air scrubbing equipment are fully operational and that the equipment is in a conditioned space on the day the equipment arrives.
   4. Furnish and install replacement air scrubber media, air filters, etc., as required for proper operation of the environmental control equipment.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with the requirements of Section 01300 of the Contract Specifications. Include:
   1. Dimensioned/scaled top and bottom enclosure views, front enclosure elevations, and internal component/device layouts
   2. One-line diagrams and wiring diagrams, as applicable,
   3. Catalog cut sheets. Include protective device coordination curves and current limiting circuit breaker/fuse peak current let through curves, where applicable. Include color chart for control panel color selection by the OWNER.
   4. Additional information as described in Appendix A – Packaged System PLCs Programming Criteria.

B. Where Programmable Logic Controllers (PLCs) are provided as part of the PCS (refer to Section 2.03, this Section of the Specifications), submit PLC programming documentation in accordance with the requirements of Section 01300 of the Contract Specifications. Include:
   1. PLC program input/output point listing, including all PLC software input/output points obtained through all serial communication interfaces. Include points obtained from the OWNER's Distributed Control System that are necessary for proper operation of the PCS. Multiple submittals of this listing will be required to facilitate the PLC programming coordination specified herein. The input/output point listing shall be provided electronically in Microsoft Excel format. The input/output point listing shall be submitted along with the product data. Submittals excluding the input/output point listing shall not be accepted. At minimum, the following shall be identified in the input/output point listing for each input/output point:
      a. Register Address: The PLC register address associated with the point
      b. Tag Name: the tag name as assigned in the PLC program for the data point
      c. Description: the description of the data point
      d. Data Type: the data type as used in the PLC program (integer, floating point, etc.)
      e. Origin. For those points transmitted via a serial communication network, the PLC identifier and its associated register address
      f. Terminal block locations.
      g. Additional supplementary information as recommended by the packaged control system manufacturer to enhance the understanding of the i/o listing.
   2. Submit a Plant Control System interface table in electronic Microsoft Excel file format. The Plant Control System interface table is to consist of only those data points in the packaged system vendor's PLC data registers that are to be shared with the OWNER'S Top-End computer system and/or PLC system via the Modbus/TCP communication with the packaged control system PLC. This plant control system interface table should consist of ONLY points that are intended to be shared with the plant control system (Plant PLC's and plant SCADA computers). These data points should include, in particular, equipment status (e.g., on/off), process values (e.g., pressure, level, flow, etc.), equipment mode (e.g. manual/auto or lead/lag), alarms, data points associated with the protective relays/power monitoring units and telemetered through the Modbus/TCP communication data link connected to the PCS (minimum points

as described hereinafter), and additional data points that are available to or can be developed by the PCS as requested by the Owner. The table should also include control commands and setpoints (if appropriate and as deemed fit by the vendor). No other data points, e.g. internal/temporary registers, should be listed in this table. The quantity and type of input/output points to be made available to the OWNER'S Distributed Control System through the serial communication interfaces will be determined after Bid Award. Provide the input/output points as requested by the OWNER at No Additional Charge to the OWNER. The Plant Control System interface table is to consist of the following columns:

a. Register Address: The PLC register address associated with the point
b. Tag Name: the tag name as assigned in the PLC program for the data point
c. Description: the description of the data point
d. Data Type: the data type as used in the PLC program (integer, floating point, etc.)
e. EGU Min: Minimum value for data point (for non-Boolean values). It is assumed the point is scaled to the engineering units (EGU) value in the vendor PLC for use by the plant control system
f. EGU Max: Maximum value for the data point (for non-Boolean values). It is assumed the point is scaled to the engineering units (EGU) value in the vendor PLC for use by the plant control system.
g. EGU: engineering units used (for non-Boolean values).
h. Bool 0 Desc: The description of the Boolean point when it is Boolean 0
i. Bool 1 Desc: The description of the Boolean point when it is Boolean 1
j. Alarm Priority: The alarm priority (for alarm points only) is to be one of H, M, or L, where H = High priority alarm, M = Medium priority alarm, L = Low priority alarm
k. Direction: The direction is to be one of R, W, or RW, where: R = Data is read by the plant control system from the vendor PLC , W = Data is written by the plant control system to the vendor PLC, RW = Data is read and written by the plant control system from/to the vendor PLC
l. Discrete Commands from plant HMI to PLC: If any discrete command bits are required from the plant HMI control system to the PLC, then the PLC will reset the command bit to zero at the end of each PLC scan. The command is to take action in the vendor PLC on Boolean 1, and have no action in the vendor PLC on Boolean 0.
m. All alarms shall be Boolean such that 0 is the normal condition and 1 is the alarming condition
n. Heartbeat Register in each PLC: For each PLC, please provide a heartbeat register that increments once every 0.1 seconds, is of Type INT and has a range of 0 to 32767
o. Boolean Status Points: Map all 0x (%M) register Boolean points to 4x registers (%MW) words of WORD data type and provide indexing into the 4x register to attain the Boolean value. All equipment on/off statuses shall be Boolean such that 0 = OFF, 1 = ON

3. Completed Host Pack spreadsheets. The OWNER will furnish Host Pack spreadsheets electronically in Microsoft Excel format. Include effort to coordinate with the OWNER related with the Host Pack spreadsheets and submit the completed Host Pack spreadsheets in electronic Microsoft Excel file format. The formatting of the Host Pack spreadsheets may not be altered

without prior approval from the OWNER. Refer to Appendix B – Host Pack Spreadsheets for additional requirements for bidding purposes.

4. Minimum data points to be telemetered by the PCS for protective relays/power monitoring units that are connected to the PCS are as follows: Voltage (average, A-B,B-C,C-A), Current (average, A, B, C, Ground), power factor, horsepower, kw, kvar, kva, mwh, and all alarms and trip conditions that are configured on the protective relay/power monitoring unit.
5. Electronic files of PLC program in editable electronic files and PDF on CD-ROM. Follow the file format as described hereinafter.
6. Electronic files of the OIU screens in editable electronic files (Schneider Electric Vijeo *.vdz file format) and PDF on CD-ROM. Follow the file format as described hereinafter.
7. Additional information as described in Appendix A – Packaged System PLCs Programming Criteria.

C. Sequence of operation. In addition to the operation of the PCS, include the OWNER's process/mechanical equipment that shall also be monitored/controlled by the PCS, where applicable.

D. Testing Related Submittals:
   1. Submit ORT test procedures and test results per Section 17100.
   2. Submit PAT test procedures and test results per Section 17100.

E. Certified Report: Submit a report prepared by PCS Manufacturer's technical representative certifying satisfactory installation, operation, and in service placement of entire PCS.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Furnish Operation and Maintenance Manuals in accordance with the requirements of Section 01730 of the Contract Specifications. Include:
   1. Installation and operation manuals
   2. Renewal parts bulletin: Identify parts with ID# and part number for each item with assembly view diagrams.
   3. As built drawings, including approved shop drawings
   4. Test data
   5. Software program hardcopy (as applicable) for final as-built software
   6. Additional information as described in Appendix A – Packaged System PLCs Programming Criteria

1.07 TOOLS AND SPARE PARTS

A. Furnish the following spare parts with the equipment for each PCS in conformance with the specifications:
   1. One (1) – Set of fuses (minimum 3) for each type and size used for fuses 110V and greater.
   2. One (1) – Set of starter contacts for every three (3) like starters used (a minimum of 1 for each size used). If contacts are not replaceable a spare starter for each size used shall be supplied.
   3. One (1) - Contactor coil for every NEMA size and type starter installed; a minimum of one coil per size.

4. One (1) - Spare control relay, complete with all accessories, for each relay type used.
5. One (1) - Spare timing relay.
6. One (1) – Sets of overload heaters for each size and type used.
7. One (1) – Selector switch, complete with 2 auxiliary contacts, of each type used (two position, three position, etc.).
8. One (1) – Pilot light, complete with auxiliary contact, of each type used.
9. One (1) - Push button, complete with auxiliary contact, of each type used.
10. Ten percent - terminal blocks, of each type and color used.
11. Ten percent – PLC input/output modules, with minimum of two of each module type used.
12. Ten percent – PLC CPU and Ethernet networking modules, with minimum of one of each module type used.
13. Ten percent – PLC CPU memory cards, with minimum of five of each type used.
14. Ten percent – Ethernet switches, minimum of one of each type used.
15. Ten percent – OIU, with minimum of one of each type used.
16. One (1) spare PLC rack of each type used.
17. One (1) spare power supply of each type of power supply (24VDC, etc.) used.

1.08 SPECIAL MANUFACTURER SERVICES

A. Where PLCs are provided as part of the PCS (refer to Section 2.03, this Section of the Specifications):
   1. The PCS Manufacturer shall include, at minimum, four (4) meetings dedicated for the purpose of coordinating PLC programming and OIU screen development. The meetings shall be conducted to assist in the coordination effort needed to interface the PCS with the OWNER's Distributed Control System, inclusive of all the OWNER's PLCs and Top-End (host) computer system, and coordination of PCS PLC algorithm development and OIU screens where required to achieve the overall functional requirements of this Specification. The PCS Manufacturer shall provide a non-sales type representative to attend each meeting who is also intimately familiar with the PLC programming of the PCS. For bidding purposes, each meeting shall have a four hour duration and be held at the OWNER'S project site. At each meeting, the PCS Manufacturer shall also provide a submittal of the PLC program input/output point listing, sequence of operation, and electronic files of the PCS PLC program developed to date. Refer to the Submittals section of this Specification for minimum composition of input/output point listing, sequence of operation, and electronic PLC program files. The PCS Manufacturer shall include all necessary travel, submittal reproduction, and miscellaneous other expenses associated with their meeting attendance.
   2. PLC software registers associated with the input/output point types (i.e., discrete input, discrete output, analog input, analog output) that are telemetered to the OWNER's distributed control system shall be organized contiguously among each input/output point type.
   3. In the software programming, adhere to the software tagging as described in "Appendix C – Software Tagging Criteria" to the extent practicable. Coordinate software tagging with the OWNER.

B. Furnish the services of a qualified, experienced, factory trained technical (non-sales type) representative to advise the Contractor in the installation of the equipment and assist in all PCS testing and start-up. Include checking alignment of parts, wiring connections, operation of all panels, parts (relays, starters, PLCs, etc.). Include time to correct and recheck any discrepancies which are discovered. Also include providing the OWNER with a report certifying that the equipment was installed, properly tested, and set in accordance with the PCS manufacturer's requirements and is in satisfactory operating condition. Format and quantity of reports shall be per the requirements of Section 01300 of the Contract Specifications.

C. Any problems encountered with the operation of equipment, parts, components, etc. installed within the PCS shall be repaired/remedied by the manufacturer's technical representative.

PART 2 PRODUCTS

2.01 GENERAL

A. Furnish and install all necessary components and wiring for a complete and functional system. Furnish and install additional requirements as follows:
   1. Furnish and install the enclosure as hereinafter specified. Mount and wire all components inside of enclosure unless specified otherwise. The enclosure, with all components mounted and wired, complete with all accessories, shall be referred to hereinafter as the Control Panel.
   2. Furnish and install the Control Panel configured for single point electrical feed that terminates on a dedicated main circuit breaker inside of the Control Panel. Refer to the PLANS and also the appropriate Division 11 Specification for which the PCS is provided for voltage and phase requirements. The Control Panel shall contain all necessary means, i.e. , control power transformer with primary and secondary short circuit protection/disconnects, uninterruptible power supply, associated wiring, short circuit protection, etc. to derive and distribute the needed control power at the necessary voltages for the entire PCS.
   3. Furnish and install the control system Type as hereinafter specified.
   4. Furnish and install motor starters/drives as specified herein, by other Sections of the Specifications, and the PLANS. Size, furnish, and install motor starters/drives complete with all accessories as specified.
   5. Furnish and install circuit breakers for branch circuits distributed from Control Panel as hereinafter specified. Coordinate operation of branch circuit breakers with corresponding main circuit breaker for proper circuit isolation and protection. Note, the main circuit breaker for the control panel per paragraph 2.01.A.2 shall not be considered a branch circuit breaker for the purposes of this Specification.
   6. Furnish and install field devices that are fully corrosion resistant, water tight, and resistant to all chemicals associated with the process application. All field devices life cycle, operation, and accuracy shall not be affected by the process application. As a minimum, all field devices shall be U. L. Listed and NEMA 4X rated. The mounting arrangement shall include provisions to enhance operation and maintenance of the system in consideration of the process application.

7. Where devices are required for the functional operation of the PCS but are not specified under Division 17, furnish and install manufacturer's standard.
8. Where process taps/connections are located higher than 5 feet above finished floor/grade, furnish and install remote mounted indicating transmitters and extend tubing as required to facilitate mounting transmitters no higher than 5 feet above finished floor/grade.
9. For additional construction notes and special requirements, refer to the PLANS and the Specifications.

B. Analog, Control, and Alarm Signaling Requirements
   1. Refer to the PLANS and also the appropriate Division 11 Specification for which the PCS is provided for minimum contacts to be connected to the OWNER's Distributed Control System.
   2. All control and alarm circuits shall be 120 volts A.C. Alarm signal contacts shall open to alarm and shall be isolated contacts rated for 5 ampere at 120 volts A.C.
   3. The contact configuration (normally open/closed) required for proper interface to the OWNER's Distributed Control System shall be furnished and installed at No Additional Cost to the OWNER. Under no circumstances shall contacts of pushbuttons and selector switches be connected to the OWNER's Distributed Control System via interposing relays. Refer to Section 17600 for minimum interface requirements to the OWNER's Distributed Control System.
   4. All analog signals shall be 4 to 20 mA DC. Use "two-wire" type circuits where possible. Furnish and install loop current isolators for each analog signal circuit in which either the field device or Control Panel is located outdoors. Loop current isolators shall be per Section 17200.
   5. All RTD signals shall be 100 ohm platinum type.

C. Selector Switches, Pilot Devices, Pushbuttons requirements:
   1. For NEMA 12 rated enclosures: Furnish and install per Section 17200.
   2. For NEMA 4X rated enclosures: Furnish and install per Section 16540.
   3. Mount on enclosure door.

D. Wiring: Furnish and install as specified in Section 17200 and 17600. Group conductors and route in wireways as specified in Section 17200. Wire insulation pigmentation for 480 VAC circuits shall be per Section 16200. Field wiring shall be per Section 16200.

E. Identification: Tag enclosure, terminal blocks, and devices (mounted interior and on the face of the enclosure) as specified in Section 17200. Tag all wiring per the requirements of Section 16200.

F. Grounding: Furnish and install grounding per Section 17200.

G. Miscellaneous Accessories:
   1. Furnish and install lugs/ power distribution blocks /terminal blocks as required for the connection of the field wiring. Furnish and install terminal blocks per Section 17200. Furnish and install the necessary means for the termination of the field wiring at No Additional Cost to the OWNER.
   2. Furnish and install a Type 2 surge protective device for the 120 VAC package control system control power circuitry. Wire, and mount inside the enclosure.

3. Furnish and install 24 volts DC power supply and all other power supplies per the PCS manufacturer's requirements where not specified per Section 17200. Wire and mount inside the enclosure.
4. Where an uninterruptible power supply is needed for the application, furnish and install per Section 17200. Packaged control systems having PLCs shall also be furnished with uninterruptible power supplies per Section 17200.
5. Arrange the enclosure internal components to coordinate with the OWNER's conduit entry requirements at No Additional Cost to the OWNER.
6. Where junction/pull boxes are required, furnish and install per Section 16250.

H. All outdoor located enclosures and field indicators/transmitters shall also have a sunshield hood per Section 17380 and as detailed on the PLANS, with the following exceptions:
1. PCS manufacturer to adjust the sunshield dimensions as necessary to coordinate with the dimensions of the control panel/instrument.
2. The hinged flap detailed on the PLANS is not required for control panels.
3. Orient as described on the PLANS and coordinated with the Owner.

2.02 CONTROL PANEL ENCLOSURE REQUIREMENTS

A. Enclosure shall be the totally enclosed, dead front, suitable for back-to-wall mounting. Free standing and wall mounted enclosures may be used. Enclosure shall be adequately sized to contain all of devices required for the PCS in addition to facilitating the termination and routing of all associated PCS field interconnect conduit/wire systems.

B. Unless specifically noted otherwise elsewhere, enclosures shall be rated:
1. Enclosures located outdoors: NEMA Type 4X, Type 316 Stainless Steel enclosures. Enclsoures shall have a smooth, non-brushed finish.
2. Enclosures located indoors in process/mechanical areas and storage areas that are not environmentally and climate controlled: NEMA Type 4X, Type 316 Stainless Steel enclosures.
3. Enclosures located indoors in areas that are environmentally and climate controlled: NEMA 12-gasketed, painted steel enclosures per Section 17200.

C. Enclosure shall have hinged, gasketed doors. Each door shall have an operating handle. At minimum, Furnish and install quarter turn door latch. Furnish and install three point door latch where available for the enclosure. Furnish and install pad locking means for the door/handle.

D. Enclosures shall have a door mounted variable depth disconnect operating mechanism for operating the main circuit breaker and providing access to the 480V compartment. Provide padlockable disconnect operating handle. Handle shall be mechanically interlocked with the door/barrier to prevent personnel from opening the door and accessing the 480V compartment when the unit disconnect is in the ON position. Furnish and install handle-door interlock defeating (bypass) feature. Disconnect operating mechanism shall be as manufactured by Square D Class 9421 or approved equal. Electric actuated door interlock means will not be accepted.

E. When sizing the enclosure, consideration shall be given to the enclosure installation location and the environmental aspects associated with the location (indoors, outdoors, etc.). Enclosures shall be sized to adequately dissipate heat generated by the equipment contained therein. Enclosures shall be provided with the necessary climate control devices, i.e. air conditioners, cooling fans, thermostatically controlled heaters, as required, for proper PCS operation. All outdoor located enclosures containing PLCs shall have air conditioners as hereinafter specified.

F. Furnish and install enclosure manufacturer's factory interior backpanels and sidepanels as required to facilitate interior device mounting. Panels shall be factory painted white.

G. For all PCS enclosures containing components rated greater than 120 VAC and components rated 120 VAC and less, the enclosure shall consist of two compartments. Each compartment shall have an independently operating door. A barrier shall extend the full height and depth of the enclosure to separate the two compartments and isolate power and control components rated 120 VAC and less from all components rated greater than 120 VAC.

H. The following are required for all outdoor enclosures containing PLCs and for indoor enclosures containing PLCs that are located in Process/Mechanical areas and Storage areas that are not environmentally and climate controlled:
   1. Air Conditioner:
      a. Sizing and Quantity: Provide the size and quantity of units as required for the application environment.
      b. Type: Thermostatically controlled packaged closed-loop air conditioner climate control unit surface mounted to the exterior side of the control panel. Suitable for use in an outdoor corrosive environment and also rated Class 1 Division II.
      c. Material: NEMA 4X, Type 316 Stainless Steel enclosure suitable and rated for use in corrosive environment, 16-gauge minimum thickness. Internal components shall be coated for corrosion protection.
      d. Electrical Service: Connect to the PCS single point electrical service via a dedicated circuit breaker.
      e. Controls:
         1) Provide air conditioner manufacturer's standard air conditioning system package control system for the air conditioner. The air conditioner shall have the capability to be controlled by the industrial thermostat specified hereinafter.
         2) Each air conditioner shall include low ambient controls to allow the unit to operate down to 0 degrees Fahrenheit ambient conditions.
         3) Provide a dedicated thermostat for each air conditioner. The thermostat shall be per Section 17200. The thermostat for each air conditioner unit shall be mounted inside the cabinet.
      f. Accessories:
         1) Condensate Management System: Each air conditioner unit shall have a condensate management system that evaporates moisture from the enclosure into the condenser air stream and shall not require disposal of liquid condensate and shall not cause build-up or spillage of liquid condensate.

2) Air filters: Field replaceable aluminum filters.
3) Extension frame with self-contained Drip Pan Tray
4) Mounting gaskets and hardware for a complete installation
5) Reinforce the cabinet enclosure as required to support the air conditioner.

g. Manufacturer: EIC Solutions, or approved equal.

2. Cabinet Interior Insulation:
   a. General:
      1) Provide insulation for interior of cabinet to the extent practicable to reduce heat transfer.
      2) Install in accordance to manufacturer requirements, minimize the number of duct board sections and provide no gaps between sections
      3) Install with cleanable aluminum foil (FRK) facing on exposed surface such that no bare fiberglass surface is exposed or visible. Install panels and other equipment onto cabinet such that insulation is not compressed.
      4) Securely fasten duct board onto cabinet interior surface with adhesive with 100 percent coverage of adhesive at board fiber side contact with cabinet inner surface area.
      5) Where heat dissipating device or other device is mounted onto cabinet panel, provide a 1-inch gap between duct board and device or as required to allow proper operation of device per device manufacturer requirements.
      6) Neatly cut duct board to provide a clean finished appearance.
   b. Material: 1-inch thick fiberglass duct board having a rigid resin bonded and flame retardant fibrous glass board with a damage-resistant reinforced aluminum foil (FRK) facing
   c. Thermal Conductivity: (K at 75 degrees Fahrenheit) no greater that 0.23 BTU-inch per hour foot-squared degree Fahrenheit.
   d. Adhesive, tape, and duct board installation shall comply with NFPA 90A or NFPA 90B and UL 181A and ASTM C 916.
   e. Manufacturer: Owens Corning series QuietR or approved equal
   f. Accessories:
      1) Tape: Aluminum foil / scrim / kraft (FSK) 3-inch minimum width non-tearable with diamond patterned backing, a rubber based adhesive system, and shall meet requirements of UL 723 and as manufactured by Shuretape or approved equal.
3. Space Heater:
   a. Sizing and Quantity: Provide the size and quantity of units as required for the application environment.
   b. Type: Thermostatically controlled. Provide a dedicated thermostat for the space heater. The thermostat shall be per Section 17200. The thermostat shall be mounted inside the enclosure.
4. Interior Enclosure Ambient Air Temperature Transmitter: Furnish and install a temperature transmitter to monitor the interior cabinet ambient air temperature. Transmitter shall be per Section 17380. Although not shown on the PLANS, connect the 4-20mADC analog output from the transmitter to the packaged control system PLC for remote monitoring by the OWNER'S Distributed Control System. The internal cabinet ambient air temperature shall be visible exterior of the cabinet, regardless if the temperature value is displayed on any

OIU screen. Furnish and install a discrete digital indicator as required to display the internal cabinet ambient air temperature.

I. Furnish and install the following additional accessories for each enclosure:
   1. For each door:
      a. Grounding bonding jumper.
      b. Door stop kit.
      c. 12-inch door data pocket.
   2. For free standing enclosures:
      a. Furnish and install light fixture per the requirements of Section 17200.
      b. Furnish and install wire convenience receptacle per the requirements of Section 17200.
      c. Furnish and install lifting eyes.
   3. Furnish and install all additional enclosure accessories, mounting hardware, 19 inch rack accessories, etc., as required for a functional PCS.
   4. Additional requirements for indoor enclosures located in areas that are environmentally and climate controlled: Furnish and install enclosure complete with all accessories per Section 17200.

J. Enclosures shall be as manufactured by:
   1. All outdoor enclosures and indoor enclosures located inside process/mechanical areas and storage areas that are not environmentally and climate controlled:
      a. Wall mounted control panel: Hoffman Concept Stainless Steel 4X Wall Mounted Enclosure Series with CWHPTO Padlock Handle, or approved equal.
      b. Free Standing control panel: Hoffman Free-Standing Single and Dual Access with 3-Point Latches and Lockable Powerglide® Handles, Type 4X Enclosures, or approved equal.
   2. Indoor enclosures located inside environmentally and climate controlled areas: Furnish and install per the requirements of Section 17200.

2.03 PACKAGED CONTROL SYSTEM TYPES

A. The PCS shall use one of two types of control system types to implement the packaged control system functionality as follows:
   1. Type A: At minimum, this type shall employ the use of PLCs as described hereinafter. PLCs in combination with hardwired relay logic may be used at the PCS Manufacturer's discretion.
   2. Type B: This type shall only employ the use of hardwired relay logic. This control system type shall not include the use of PLCs whatsoever. Additionally, any type of micro-processor based programmable relay, any relay requiring software download, or any other type of similar programmable relay shall not be used. As technology advances over time, similar appearing devices are subject to review and approval by the OWNER after Bid Award and the PCS Manufacturer shall incorporate the OWNER's request at No Additional Cost to the OWNER.

B. Additional requirements for Type A systems only:
   1. General:
      a. The PLC, as specified in Section 17600, shall be selected by the PCS Manufacturer to meet the functional requirements of this Specification and also the appropriate Division 11 Specification for which the PCS is provided. Additional types of PLCs beyond those specified in Section 17699 shall not be accepted.
      b. All equipment shall be furnished and installed complete with all necessary software.
      c. As a minimum, the PCS shall communicate with the equipment as shown on the control system architecture, in addition to the OWNER'S Top-End computer system. Program the PCS accordingly.
   2. Operator Interface Unit (OIU):
      a. Furnish and install OIU as specified in Section 17600
      b. Furnish and install the additional quantities of OIUs as may be required by the PLANS or Specifications.
      c. Mount OIU on enclosure door, providing additional enclosure accessories (window kit, etc.) as needed to achieve appropriate NEMA rating.
      d. Furnish and install a sun shield as specified in Section 17380 for all OIUs installed on enclosures located outdoors.
   3. Miscellaneous:
      a. Furnish and install the Ethernet switches, patch panels, and related hardware/accessories as specified in Section 17600 and as shown on the PLANS to facilitate the network data connections of the PCS to the OWNER's Distributed Control System.
      b. Although not shown on the PLANS, furnish and install one 120Vac, 1P-20A GFI convenience receptacle and 1 Cat 5e Ethernet data port receptacle with NEMA 4X rated hinged UV resistant clear polycarbonate cover. Receptacles shall be accessible from control panel exterior without requiring access to internal control panel components. Wire receptacles to Ethernet switch and control power supply of internal control panel. Furnish and install receptacles as manufactured by Hubbell "Panel-Safe", model PR4X205E or approved equal.
      c. Furnish and install additional 25 percent excess capacity over the number of inputs, outputs, and other necessary functions.

C. Requirements common to Types A and B systems:
   1. Refer to the PLANS and also the appropriate Division 11 Specification for which the PCS is provided for the control system type.
   2. Furnish and install control relays and timing relays as specified in Section 17200.

2.04 MAIN AND BRANCH FEEDER CIRCUIT BREAKERS

A. Furnish and install thermal magnetic molded case circuit breakers. Size per NEC. Circuit breakers shall have U.L. listed minimum RMS symmetrical short circuit current rating equal to or greater than that of the bus serving the equipment, unless noted otherwise on the PLANS or in the Division 11 Specifications. Unless shown otherwise, the minimum RMS symmetrical short circuit current rating shall be 42kA at 480 volts A.C.

B. Furnish and install where specifically shown on the PLANS or for proper circuit protection/coordination:
   1. Current limiting circuit breaker.
   2. Electronic trip attachment. Trip unit shall be solid state type with field adjustable long time, short time, ground fault and pick up settings.

2.05 MOTOR STARTERS AND VARIABLE FREQUENCY DRIVES

A. Each combination motor controller and feeder unit shall have the following characteristics:
   1. General:
      a. Comply with the control logic requirements of the PCS manufacturer.
   2. Molded case circuit breakers for branch circuit protection. Circuit breakers shall have the following characteristics:
      a. Shall have U.L. listed minimum RMS symmetrical short circuit current rating equal to or greater than that of the bus serving the equipment, unless noted otherwise on the PLANS or in the Division 11 Specifications. Unless shown otherwise, the minimum RMS symmetrical short circuit current rating shall be 42kA at 480 volts A.C.
   3. Starters shall have the following characteristics:
      a. Starters shall be magnetic type, NEMA rated, with 120 volts A.C. operating coils. International type starters (IEC rated), will not be accepted, even if the starters were to show equivalent NEMA ratings.
      b. Size and configuration (full voltage non-reversing, full voltage reversing, etc.) as required for the application. Size per NEC and provide minimum of NEMA Size 1.
      c. Provide each starter coil with the manufacturer's standard transient voltage surge suppression module.
      d. Provide auxiliary contacts as required by the PLANS. Contacts shall be rated for 120 volts A.C and shall satisfy the requirements of the PLANS. Provide each starter with one (1) normally open auxiliary contact wired to terminal blocks over the number of contacts required by the PLANS.
   4. Provide Overload relays. Overload relays shall have the following characteristics:
      a. Standard class 20, ambient compensated,
      b. Manually reset by push-button located on front of the compartment door.
      c. Provide with auxiliary contact rated for 120 volts A.C. Contact shall satisfy the requirements of the PLANS.
      d. The overload relay heaters will be selected by the Contractor after delivery of the MCC. Include all necessary delivery, packaging, and administrative costs associated with the delivery of overload heaters.
   5. Control Power Transformer:
      a. Dedicated control power transformer for each motor starter is not required. Serve starter control power from PCS control power distribution per the manufacturer's standard.
   6. Power Factor Correction Capacitors (PFCCs):
      a. Furnish and install PFCCs for all constant speed motors sized three horsepower and larger. Exception: Motorized valves and reversing/jogging process applications do not require power factor correction capacitors.
      b. Connect capacitors between the motor starter and the overload relay.

7. Provide one single pole fuse block with fuse for each motor space heater.
8. Variable Frequency Drives:
    a. Each variable frequency drive starter assembly shall include a NEMA rated main output contactor that is electrically interlocked with the VFD controller and full voltage bypass starter. The VFD shall have a micro-processor based controller equipped with the manufacturer's standard features for protection, operation, and data acquisition of a VFD system. The operation of the controller shall also be coordinated with the operation of the Owner's existing distributed control system logic. Provide supplementary control relays and interlocks as required for the proper interconnection and operation of the VFD with the Owner's existing distribution control system logic.
    b. Each VFD shall be a 6-pulse Pulse Width Modulated (PWM) design converting the utility input voltage and frequency to variable voltage and frequency output. The manufacturer shall supply 6-Pulse bridge rectifier design, at minimum. The VFD shall connect to an externally mounted drive isolation transformer, where required.
    c. Each VFD shall be UL 508C tested.
    d. Incomplete sequence protection of each VFD main output contactor shall be provided with interlocking circuitry to fault the VFD should the contactor fail to close when commanded.
    e. The VFD section containing the VFD shall have a minimum of one (1) door mounted ventilation fan rated at 120VAC, thermostatically controlled, fused, and wired to the control power transformer. Ventilation fan to provide positive forced air ventilation of MCC section containing the VFD. Provide dedicated thermostat for each VFD. Furnish additional ventilation fans as required in accordance with VFD Manufacturer's recommendations to provide for proper VFD heat exchange.
    f. The VFD section shall also be supplied with a high ambient temperature switch separate from the fan control thermostat to detect excessive VFD section temperature. Wire switch contacts to shut down the VFD and telemeter a common alarm to the Owner's existing distributed control system.
    g. Each VFD shall be designed to operate in an ambient temperature from 0 to 40 degrees Celsius.
    h. Each VFD shall be designed to operate from an input voltage of 480 plus or minus 15 percent VAC.
    i. Each VFD shall operate from an input voltage frequency range of 60 Hz with plus or minus 2 percent.
    j. The displacement power factor shall not be less than 0.975 lagging under any speed or load condition.
    k. The efficiency of each VFD at 100 percent speed and load shall be greater than or equal to 95 percent.
    l. Drive family (Constant torque, variable torque, etc.) to be selected by the Division 11 equipment manufacturer.
    m. The VFD minimum output current shall be as determined by the Division 11 equipment manufacturer.
    n. The control logic drawings in the PLANS show the minimum requirements for the VFD. Furnish additional controller contact inputs/outputs, interposing relays, selector switch contacts, fused power supplies, etc., as required to facilitate VFD operation.

o. A digital terminal keypad shall be provided with each starter/controller for viewing of electrical values, configuration of parameters, I/O assignments, application and activity function access, faults, local control, adjustment storage, self-test and diagnostics. The terminal keypad will consist of programmable function keys. The functions will allow both operating commands and programming options to be preset by the operator. The Keypad shall be rated NEMA Type 12 and be mounted to the face of the VFD.
p. Furnish and install VFD with harsh environment UL 746 recognized conformal coating for all printed circuit assemblies.

PART 3 EXECUTION

3.01 FACTORY INSPECTION AND TEST

A. Each control panel shall be completely assembled, wired, and adjusted at the factory and shall be given the manufacturer's routine shop test and any other additional operational test to insure the functionality, workability and reliable operation of the equipment.

B. Size, furnish and install the overload relay heaters based on actual motor nameplate current. Set overload relay settings at maximum values permitted by the NEC 430-32.

C. Size, furnish and install the motor space heater fuses based on actual motor space heater load current.

3.02 FIELD INSTALLATION (BY CONTRACTOR)

A. Mount all PCS subcomponents as shown on the PLANS and as recommended by the PCS manufacturer.

B. All field wiring shall be tagged per the requirements of Section 16200. Secure wiring in control panel with plastic ties. Arrange wiring neatly, remove surplus wire, and install abrasion protection for wiring passing through holes or near edges of sheet metal.

C. Clean and vacuum all interior of the equipment. Touch-up and restore damaged surfaces to factory finish.

3.03 FIELD TESTING

A. After field installation of the PCS and prior to energizing any of the process/mechanical equipment controlled by the PCS:
1. Conduct an ORT for the PCS per Section 17100. Submit test results for review and approval. Prior to conducting the ORT, meet all prerequisites associated with conducting the ORT as described in Section 17100. The OWNER may elect to witness the ORT. Coordinate with the OWNER accordingly.

2. Conduct a PAT for the PCS per Section 17100. Submit test results for review and approval. Prior to conducting the PAT, meet all prerequisites associated with conducting the PAT as described in Section 17100. Exception: As the application software for the PCS is provided by the PCS manufacturer, the PCS manufacturer shall lead the PAT software test activity.

3.04 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

SECTION 13390

APPENDIX A - PACKAGED SYSTEMS PLC PROGRAMMING CRITERIA

PART 4 PACKAGED SYSTEMS PLC PROGRAMMING CRITERIA

4.01 GENERAL

A. PLC Hardware to be used by packaged equipment Vendor shall be as specified in the contract bid specifications. As a minimum, the processor used to interface to the Owner's SCADA system shall support the Schneider Electric Unity Pro programming software.

B. Vendor shall use latest version of Schneider Electric Unity Pro programming software, unless otherwise directed by Owner.

4.02 PROGRAM ORGANIZATION AND STRUCTURE

A. The overall program shall be broken down into meaningful sections of code related to the operations of the equipment. As a minimum, include the following program sections:
   1. Communications - All registers that are being written to or being read from the Vendor's package system PLC from the Owner's SCADA equipment shall be grouped into one section of the program. Register addresses used for interfacing to Owner's SCADA system shall be placed in a contiguous block of registers to facilitate read and write operations
   2. Section Control - (if code includes variables to enable/disable sections of code).
   3. Process Control - If the process is complex and/or the section is very large, this section should be further broken down into permissive section(s), alarming section(s) and control section(s).
   4. Input/Output (I/O) Processing – This section includes data manipulation of physical inputs and outputs such as analog scaling, totalizing, etc.
   5. PLC Time Synchronization and Heartbeat – This section shows the registers that are to be used to synchronize the PLC's clock with the Owner's SCADA system and to determine whether the Vendor's PLC logic is executing (heartbeat) to be monitored by the Owner's SCADA system.

B. Vendor is to follow the Owner's software tagging convention for all tags being read from or written into by the Owner's SCADA system. If the Vendor elects to use their own software tagging convention in their programs that control the equipment within their own package system, then the PLC(s) that is used to interface with the Owner's SCADA system needs to include a set of registers that will be labeled with the Owner's software tagging convention and be "mapped" to the corresponding set of registers that are used by the Vendor's software program. The mapping of these registers is to be clearly labeled in the program and indicated on the Field I/O spreadsheet to be provided at the end of the job.

C. All program sections are to be clearly labeled with text that describes what the section of code does. As a minimum, include the key wording for each section as described above.

D. Provide comment lines within the sections of code to describe what the various parts of the section do, especially for those areas where the function is performing is not evident or is complex to follow.

E. All software tags in the program are to follow a structured naming convention and be clearly labeled with meaningful text descriptions to make it easy to understand what the tag represents and what function it is performing in the program.

F. Ensure that none of the programs developed have security controls enabled, i.e. password protection on DFB's, restrictions on uploading or editing program, etc.

4.03 PROGRAM DETAILS

A. Vendor is to use IEC programming languages supported by Unity Pro, and in general adopt the following guidelines.
   1. Use Derived Function Blocks (DFB) language as much as practical to standardize on process control functions.
   2. Use Structured Text (ST) language for Calculations and I/O Mapping routines.
   3. Use IEC Ladder Logic (LL) and Function Blocks (FB) for control logic and to include in DFB's.

B. Standardize the program sections and program elements (DFB, ST, etc.) as much as possible into modular and/or functional pieces of code for repetitive and often use sections of code to simplify the program and minimize its size.

C. Vendor is to set up a Custom Library for standard program elements like DFB's and FB's.

D. Use Topological (Unity Pro) Addressing on M340 PLCs for registers associated with physical I/O, i.e. %I1.3.2 and %Q1.4.3, instead of State Ram addressing (%M) since State Ram addressing convention does not reference the physical I/O location, but topological addressing does.

E. Use eBool variables if there may be a reason to keep track of previous values (history) or there is a need to look at a leading or falling edge in the signal.

F. Avoid using IEC BMDI function blocks on any of the PLC programs since Unity Pro is not able to search for registers contained within the range of that block.

G. Use IO Scanner for communication between PLC's where possible to facilitate the set-up and troubleshooting of registers that are being moved from one PLC to another.

H. Code should be designed to avoid using force bits for the logic to execute properly. Inadvertent un-forcing of bits will cause the program to behave unexpectedly.

I. Do not initialize %MW values during a cold start or a program download. Doing so can cause stored values such as run time to be over written. Ensure this option is unchecked in the programming software if the option is available.

4.04 DOCUMENTATION AND DELIVERABLES

A. As part of their Operations and Maintenance Manual, Vendor is to include, but not be limited to the following:
   1. Control Narratives that include:
      a. The various control modes of operation; i.e. remote automatic, remote manual, local automatic, local manual, maintenance mode, etc.
      b. Identification of and description of all permissive and shutdown signals that are required to operate the equipment or that will shut the equipment down.
      c. Identification of all set points and process variables that are Operator adjustable with a description of what they do and how they affect the operation of the equipment.
   2. Field I/O and Host Pack and Peer to Peer spreadsheets (example provided by Owner) to document the various software tags associated with the package equipment.
   3. Instrument Index spreadsheet showing all instrumentation on their package equipment and calibration information including, but not limited to; instrument tag name, input range, units, control loop description, scaling, trip set points, etc.

B. Vendor is to provide a copy of all program files installed in the production system and source files of all documentation listed above.

END OF APPENDIX A

SECTION 13390

APPENDIX B – HOST PACK SPREADSHEETS

PART 5 HOST PACK SPREADSHEETS

5.01 FIELD I/O LIST DESCRIPTIONS NOTES

A. General
   1. The Field Input/Output (I/O) lists only inputs or output connected to process control equipment and devices, i.e. instrument, electrical equipment, etc.. It does not include logical inputs or outputs that are generated as part of the PLC/RTU program to do data manipulation, or data that is passed on to another controller or Host computer.
   2. All inputs and outputs associated with a PLC/RTU, i.e. physical and logical points, are shown on the Host Pack list if they are being transmitted/received by a Host computer, or are shown in the Peer to Peer Data Communications List, if the values are being shared with another peer device.

B. Information required for each entry.
   1. RACK NAME - The rack name as shown on the contract drawings. Note this name is for cross-reference only. The actual drop, and rack number used in the software configuration will be as specified in the DROP, and RACK column of the Field I/O List.
   2. FIELD DEVICE TAG - The name of the end device, in accordance with the INFOR (maintenance management system) naming convention and tagged in the field and/or on the contract drawings. This field is used as a cross-reference to the Host Pack table.
   3. DESCRIPTION - The description of the signal. This description shall be used consistently throughout the application software.
   4. CARD/MODULE TYPE - The Modicon model number located in the corresponding slot.
   5. POINT TYPE - The point type indicates AI, AO, DI, or DO for analog input, analog output, discrete input, or discrete output, respectively.
   6. DROP, RACK/BASE – The drop and rack number associated with the chassis. These fields define the required drop, rack assignment for the configuration of each chassis associated with the processor.
   7. SLOT - This field defines the physical location of the module within a given chassis.
   8. I/O POINT – This field defines the specific point on the module.
   9. CARD/MODULE TERMINALS – Physical wiring termination points on the I/O card/module.
   10. FIELD I/O ADDR. - The software register address where the I/O module places the data for the point. This field is used as a cross-reference to the Host Pack table.

11. BIT NO. - The bit within the register address where the I/O module places the data for the point, as required. This field is used as a cross-reference to the Host Pack table.
12. EGU LOW - The value of the signal at 4 mA in the specified engineering units. This information is only applicable to analog signals.
13. EGU HIGH - The value of the signal at 20 mA in the specified engineering units. This information is only applicable to analog signals.
14. EGU - The engineering units for the analog signal. This information is only applicable to analog signals.
15. SCALED IN PLC? – Defines whether or not the analog value is scaled in the PLC, or if scaling occurs at the top end. This information is only applicable to analog signals.
16. RAW LOW - The value of the signal at 4 mA in counts as written to the PLC register by the I/O module. This information is only applicable to analog signals.
17. RAW HIGH - The value of the signal at 20 mA in counts as written to the PLC register by the I/O module. This information is only applicable to analog signals.
18. SIGNAL TYPE – Electrical characteristics of the signal, i.e. 4-20 mA, 1-5 VDC, etc.
19. TERMINAL BLOCK - The name of the block of terminals where field wiring is terminated.
20. TERMINAL NO'S - The terminal numbers within the terminal block where the field wiring is terminated.
21. LOOP DIAG. – The number of the drawing where a loop drawing is shown for the signal loop. These could either be loop-specific drawings, or typical loop drawings.
22. P&ID No. – The number of the P&ID drawing where the I/O point is shown on the drawings.
23. NOTES - Miscellaneous notes to further describe the signal. This field contains information such as square root (SQRT) for analog inputs, analog alarm setpoints, shelf states for discrete inputs, etc.

5.02 HOST PACK FIELD DESCRIPTIONS NOTES

A. General Information
   1. Physical Inputs and Outputs (I/O) refer to connections to instruments and/or device/equipment including: motor status contacts, valve position switches, pump start/stop commands, etc.
   2. There are two different tagging standards for physical I/O points, depending on whether they are instruments or signals coming from or going to equipment/devices other than instruments.
   3. Instrument tags follow the ISA standards and are somewhat different from the other physical I/O points, i.e. equipment and devices, in that those tags include not only an equipment code, like the instruments, but it also includes a Function Descriptor Code that is up to four characters long. Since a piece of equipment/device may have multiple I/O points connected to it (such as a

motor starter) the Function Descriptor Code ensures uniqueness and clarifies the function performed by the specific I/O.

4. Software TagNames assigned to a PLC/RTU program are identical to the physical I/O points, i.e. Instrument Tags and Equipment/Device Tags.
5. Software TagNames that are generated by a controller or a host computer that are not tied directly to a physical I/O point, follow the same convention as the equipment and instrument tags, except a suffix is added to the end of the physical tag to indicate the origination/destination of that software tag, i.e. whether the point is logically created in the PLC/RTU or Host program and were it is sending its information to.

B. Information required for each entry.
   1. Host SCADA Configuration Information – the fields in this section relate to configuration of alarming and general point information for use in the SCADA Host database.
      a. HOST NODE NAME(S) - The computer name of PMCS SCADA Servers which will be polling the PLC, including OIUs.
      b. HOST TAGNAME - The tagname used in the PMCS host software to reference the input point.
      c. DB TYPE - The database point type used in the OIU and PMCS database definition for the point. See Table 4-3 in the System Integration Design Guide for a list of available database point types.
      d. HOST DESCRIPTION - A description of the signal. The description field is limited to 40 characters.
      e. ACTIVE STATE (1) - The definition of the energized state for a discrete point.
      f. INACTIVE STATE (0) - The definition of the de-energized state for a discrete point.
      g. ALARM STATE – Defines if either the Active or Inactive states will be used to generate an alarm a discrete point.
      h. LOLO ALARM - The setpoint for the low low alarm limit for an analog point.
      i. LO ALARM - The setpoint for the low alarm limit for an analog point.
      j. HI ALARM - The setpoint for the high alarm limit for an analog point.
      k. HIHI ALARM - The setpoint for the high high alarm limit for an analog point.
      l. ALARM PRIORITY - The alarm priority. The alarm priority shall be defined as L, M, or H for low priority alarm, medium priority alarm, or high priority alarm, respectively. If the point does not require alarming, then this field shall be blank for the point. If multiple analog alarm setpoints are defined, alarm priorities shall be indicated for each alarm type.
   2. PLC Host Read/Write Area – the fields in this section define the interface between the host database and the PLC/RTU.
      a. HOST I/O ADDR - The register address in the PLC which the host will read to get the current value of the point.
      b. HOST BIT NO - The bit within the register address in the PLC which the host will read to get the current value of the point.

c. HOST PLC DATA TYPE - The data type of the signal in the PLC register. This defines how the PMCS interprets the data in the PLC register(s). Options for this field are based on the data types used in the PLC/RTU.
d. PLC SOFTWARE TAGNAME - The name of the register(s) that the PMCS host will read to current value of the point, as defined in the PLC/RTU software.

3. PLC Intermediate Area – the fields in this section identify any intermediate registers used in the PLC/RTU to perform calculations or process the input signals from the I/O module.
   a. INT I/O ADDR - The register address in the PLC where the intermediate data value is stored.
   b. INT BIT NO - The bit within the register address in the PLC where the intermediate data value is stored.
   c. INT DATA TYPE - The data type of the signal in the intermediate PLC register. Options for this field are based on the data types used in the PLC/RTU.
   d. PLC SOFTWARE TAGNAME - The name of the register(s) in the PLC where the intermediate data value is stored, as defined in the PLC/RTU software.
4. Field Interface Area – the fields in this section identify information about the field devices and register locations written to by the I/O modules.
   a. PEER DEVICE – Indicates whether or not the point is transmitted from anoter PLC, as opposed to being acquired from local I/O.
   b. FIELD DEVICE TAG - The name of the end device, in accordance with the INFOR (maintenance management system) naming convention and tagged in the field and/or on the contract drawings. This field is used as a cross-reference to the Field I/O List table.
   c. POINT TYPE - The point type indicates AI, AO, DI, or DO for analog input, analog output, discrete input, or discrete output, respectively.
   d. FIELD I/O ADDR. - The software register address where the I/O module places the data for the point. This field is used as a cross-reference to the Field I/O List table.
   e. FIELD BIT NO. - The bit within the register address where the I/O module places the data for the point, as required. This field is used as a cross-reference to the Field I/O List table.
5. Other fields
   a. PLC/RTU EQUIPMENT TAG - The name of the PLC or RTU device, in accordance with the INFOR (maintenance management system) naming convention and tagged in the field and/or on the contract drawings. This field is used as a cross-reference to the Field I/O List table.
   b. NOTES – Miscellaneous notes specific to the database point.

5.03 PEER TO PEER DATA COMMUNICATIONS DESCRIPTIONS NOTES

A. General
   1. The Peer to Peer Data Communications list is intended to only show data (inputs or outputs) that is shared between two peer devices such as PLC/RTU controllers. The list does not include any other physical I/O points connected to

the associated PLC/RTU or data points that are transmitted to or received from a Host computer.

2. For physical I/O points connected to a specific PLC/RTU, refer to the Field Input/Output (I/O) list.
3. For data points that are associated with a particular PLC/RTU that are transmitted to or received from a Host computer, please refer to the Host Pack list.
4. Information required for each entry.
    a. PLC SOFTWARE TAGNAME - The name of the register(s) that the PMCS host will read to current value of the point, as defined in the PLC/RTU software.
    b. DESCRIPTION - A description of the signal. The description field is limited to 40 characters.
    c. HOST PLC DATA TYPE - The data type of the signal in the PLC register. This defines how the PMCS interprets the data in the PLC register(s). Options for this field are based on the data types used in the PLC/RTU.
    d. ORIGINATION EQUIPMENT TAG - The name of the PLC or RTU device where the point data is coming from (source of the data), in accordance with the INFOR (maintenance management system) naming convention and tagged in the field and/or on the contract drawings. This field is used as a cross-reference to the Field I/O List table, Host Pack table, or other Peer to Peer tables.
    e. ORIGINATION I/O ADDR - The register address in the source PLC which the destination peer device will read to get the current value of the point. This field is used as a cross-reference to the Field I/O List table, Host Pack table, or other Peer to Peer tables.
    f. ORIG BIT NO - The bit within the register address in the source PLC which the destination peer device will read to get the current value of the point. This field is used as a cross-reference to the Field I/O List table, Host Pack table, or other Peer to Peer tables.
    g. DESTINATION EQUIPMENT TAG - The name of the PLC or RTU device where the point data is being written to (consumer of the data), in accordance with the INFOR (maintenance management system) naming convention and tagged in the field and/or on the contract drawings. This field is used as a cross-reference to the Field I/O List table, Host Pack table, or other Peer to Peer tables.
    h. DESTINATION I/O ADDR - The register address in the consumer PLC which the source peer device will write to provide the current value of the point. This field is used as a cross-reference to the Field I/O List table, Host Pack table, or other Peer to Peer tables.
    i. DEST BIT NO - The bit within the register address in the consumer PLC which the source peer device will write to provide the current value of the point. This field is used as a cross-reference to the Field I/O List table, Host Pack table, or other Peer to Peer tables.
    j. HOST INTERFACE? – Indicates whether the destination device passes the data to the PMCS host, or whether the data will be passed along to another peer device.

k. BLOCK MOVE TYPE – Indicates the function block or other method used to facilitate the transfer of peer data.
l. BLOCK MOVE DEVICE – The name of the PLC/RTU whose program includes the block move command. The Origination device can write the data to the Destination device, or the Destination device could read the data from the Origination device.
m. NETWORK PROTOCOL – The protocol used to transport the peer data.
n. NOTES – Miscellaneous notes specific to the database point.

HOST PACK TEMPLATE

FACILITY:

HOST/HMI NAME

Host SCADA Configuration Information										
HOST TAGNAME	DB TYPE	HOST DESCRIPTION	ACTIVE STATE	INACTIVE STATE (0)	ALARM STATE	LO LO ALARM	LO ALARM	HI ALARM	HI HI ALARM	ALARM PRIORITY

		PLC Host Read/Write Area				PLC Intermediate Area				
HOST TAGNAME	PLC/RTU EQUIPMENT TAG	HOST I/O ADDR	HOST BIT NO	HOST PLC DATA TYPE	PLC SOFTWARE TAGNAME	INT I/O ADDR	INT BIT NO	INT DATA TYPE	PLC SOFTWARE TAGNAME	PEER DEVICE?

Field Interface Area						
HOST TAGNAME	PLC/RTU SOFTWARE TAGNAME *	FIELD DEVICE TAG *	POINT TYPE *	FIELD I/O ADDR *	FIELD BIT NO *	NOTES

LEGEND

	Engineer provides information
	Contractor provides information
	Systems Integrator/Programmer provides information
*	Common field to Field I/O List or Peer to Peer

TYPICAL FIELD INPUT/OUTPUT LIST

FACILITY:

PLC/RTU EQUIPMENT TAG: * *

RACK NAME	FIELD DEVICE TAG *	DESCRIPTION	CARD/ MODULE TYPE	POINT TYPE	DROP	RACK / BASE	SLOT	I/O POINT	CARD/MODULE TERMINALS

END OF APPENDIX B

SECTION 13390

APPENDIX C – Software Tagging Criteria

For signals associated with a stand-alone instrument:

PPPPPP_TTTTTT_IIII_QQ

Where,

- PPPPPP = Process Identifier (abbreviation for process fluid shown on P&IDs)
- TTTTTT = Function Descriptor (see Software Tag Function Descriptors table)
- IIII = Unique Identifier (Loop numbers for instrument - limited to 4 characters)
- QQ = Qualifier (see Table 3-4, Primary Qualifier Codes)

For signals associated with a piece of equipment:

PPPPPP_TTTTTT_IIII_QQ
Where,

- PPPPPP = Equipment Code (as will be entered in INFOR)
- TTTTTT = Function Descriptor (see Software Tag Function Descriptors table)
- IIII = Unique Identifier (Equipment ID - limited to 4 characters)
- QQ = Qualifier (see Table 3-4, Primary Qualifier Codes)

Function Descriptor Codes

The function descriptor code is a four character code used to indicate the specific equipment data being represented by the software point. Examples of equipment data include motor status, motor fault, motor start/stop commands, etc. The following tables list the function descriptor code available for use.

11/12/2013

Software Tag Function Descriptors

Code	Type	Description
AAH	Input	High Analyzer Concentration Alarm
AAL	Input	Low Analyzer Concentration Alarm
ACNC	Input	Active Concentration
ACTP	Input	Analog Cell Temperature
ACTV	Input	Active or in Progress
AFB1	Input	Auto Flow Pace - Flow Meter 1
AFB2	Input	Auto Flow Pace - Flow Meter 2
AFBD	Input	Auto Flow Pace - Calculated Data
AFBF	Input	Auto Flow Pace - Flow Meter
ALCR	Input	Critical Alarm
ALMN	Input	Maintenance Alarm
ALARM	Input	Alarm
ALRT	Input	Alert
ALTSW	Input	Alternate Switch
AMPH	Input	High Amp
AMPL	Input	Low Amp
AMPS	Input	Amps
ASIL	Input	Motor Auto Stop Interlock
ATPT	Input	Attempt (used for substation transfer attempt Counter)
AUTO	Input	Auto
AVG	Input	Average Selected
BATA	Input	PLC Controller Battery A Alarm
BATB	Input	PLC Controller Battery B Alarm
BATGEN	Input	Generator Battery Alarm
BFTC	Input	Breaker Fail to Close
BFTO	Input	Breaker Fail to Open
BKAC	Input	Breaker Ok to Close
BKRC	Input	Breaker Closed
BKRO	Input	Breaker Open
BKWF	Input	Filter Backwash Sequence Failure Alarm
BKWH	Input	Strainer in Backwash
BKWM	Input	Filter in Manual Backwash Mode
BLCB	Input	Level Control Band
BYP	Input	Bypass (e.g., UPS)
CAPC	Input	Metering Pump Capacity
CALFLW	Input	Calculated Flow
CALLFL	Input	Call Fail
CBLA	Input	Global Communications Cable A Fault
CBLB	Input	Global Communications Cable B Fault
CFLA	Input	Communications Fail Channel A

Software Tag Function Descriptors

Code	Type	Description
CFLB	Input	Communications Fail Channel B
CHCK	Input	Check Valve Fail to Open
CLFH	Input	Hypochlorite Generator High Cell Flow
CLFL	Input	Hypochlorite Generator Low Cell Flow
CLOCK	Input	PLC Clock
CLOS	Input	Close
CLRUN	Input	Call to Run
CLSD	Input	Limit Switch Closed
CLTP	Input	Hypochlorite Generator Cell Temperature
CMERAV	Input	Total Communication Errors Average
CMERLG	Input	Total Communication Good
CMERT	Input	Total Communication Errors
CMFL	Input	Communication Fail
CMPLD	Input	Last Poll Period
CMTRLT	Input	Total Comm Transmissions
CNRA	Input	Polymer Mixing Unit Centrifuge Not Run Alarm
COMERR	Input	Communication Error
CPRM	Input	Close Permissive
CPUSTA	Input	CPU Status Diagnostic
CRSW	Input	Current Switch
CRTM	Input	Time Until Next Cleaning
CYAC	Input	Cycle Timer Accumulated Time
CYCR	Input	Cycle Freq Timer
CYRM	Input	Remaining Time Until Next Cycle
CYSP	Input	Cycle Stop
CYST	Input	Cycle Start
DATAQL	Input	Data Quality
DAY	Input	PLC Clock Day of Month
DENS	Input	Chemical Density
DRAC	Input	Duration Timer Acc Val
DRRM	Input	Time Remaining Until Duration Ends
DRPS	Input	Duration Timer Reset
DSBL	Input	Disable
DSCH	Input	Discharge Rate
DSTC	Input	Discharge to Chlorine (App Point Chlorine Injection Vaults 1-4)
DSTF	Input	Discharge to Filters (App Point is Filtered Water Injection Vault)
DSTN	Input	Discharge to None (Application Point is Not Selected
DSWF	Input	Lime Slaker Discharge Weight Fault
EMRG	Input	Emergency (e.g., ATS in Emergency Power)

Software Tag Function Descriptors

Code	Type	Description
ENAB	Input	Enable Control Status
ENAX	Input	Enable State X
ENBL	Input	Enabled (e.g., Auto Transfer at SUB enabled)
ESL	Input	Undervoltage Alarm
ESTP	Input	Emergency Stop
ET	Input	Voltage
EUH	Input	High Engineering Units
EUL	Input	Low Engineering Units
EXRNTM	Input	Extensive Run Time
EYEW	Input	Eyewash Station No. 1 Flow Switch High
FAIL	Input	Failure (e.g., PLC Fail
FAUL	Input	Fault (e.g., Lime Slurry Aging Tank Mixer Fault)
FAUT	Input	Motor Flow Pacing Auto Control Status
FDFA	Input	Flow Rate Difference Alarm (e.g., delta between calculated and actual flow)
FIT	Input	Flow Indicating Transmitter / Signal
FILFMX	Input	Lifetime Max Flow
FITOMX	Input	Today's Max Flow
FIYEMC	Input	Yesterday's Max Flow
FLOW	Input	Flow/Flow Mode
FLWO	Input	Flow Pacing Selection Reset
FLWC	Input	Hypochlorite Generator Cell Flow
FLWX	Input	Flow X Selected for Flow Pacing
FQAC	Input	Frequency Timer Accumulated Value
FQICUR	Input	Current Day Flow Total
FQILF	Input	Lifetime Flow Total
FQIPRE	Input	Previous Day Flow Total
FQITOT	Input	Calculated Flow Total
FQPS	Input	Frequency Timer Preset
FRDH	Input	Flow rate difference high (when instrument flow compared to calculated flow)
FRFS	Input	Fail to reach flow setpoint
FRPS	Input	Fail to reach position setpoint
FSL	Input	Low Flow Switch
FSP_ACC	Input	Accumulated Fail to Stop Time
FSRT	Input	Fail to Start
FSTP	Input	Fail to Stop
FTAC	Input	Fail Timer Accumulated Value
FTC	Input	Fail to Close
FTO	Input	Fail to Open
FTPS	Input	Fail Timer Preset
FUSB	Input	Fuse Blown

Software Tag Function Descriptors

Code	Type	Description
FXRM	Input	Fixed Rate Mode (vs. Level Rate Mode)
GRND	Input	Ground Fault Alarm
HDLS	Input	Headloss (e.g., filters)
HDWR	Input	Hardware
HLTH	Input	PLC Power & Scan Health Status
HOLD	Input	Hold Calculation Command
HOPP	Input	Hopper
HOUR	Input	PLC Clock Hour (Military) from Host
HTBT	Input	Heartbeat (Used for communication check)
HRUN	Input	High Speed Running Status
HSTR	Input	Motor High Speed Start Command
HVR	Input	Voltage High (e.g., battery)
ILCK	Input	Interlock
INIT	Input	Total Run-time Alarm/Hours Reset
ISRV	Input	In Service Command
KILK	Input	Key Interlock
KQAH	Input	Motor Service Alarm
KQI	Input	Runtime
KQI1	Input	Service Runtime
KQI2	Input	Lifetime Runtime
KQI3	Input	Runtime Since Start
KQILF	Input	Lifetime Runtime
KQIMN	Input	Monthly Runtime
KQIMP	Input	Previous Monthly Runtime
KQITO	Input	Today's Runtime
KQIYE	Input	Yesterday's Runtime
KWHMG	Input	KWH / MG Today
KWHMG	Input	KWH / MG Yesterday
LAUT	Input	Motor Local Auto Control Status
LAGPMP	Input	Lag Pump Run
LCRM	Input	Equipment in Local or Remote
LDRA	Input	Level Decline Rate Alarm
LDRD	Input	Level Decline Rate Difference
LEAD	Input	Equipment is Load
LEAK	Input	Leak indication (.g., high gas concentration)
LEVEL	Input	Level
LGPSTS	Input	Lag Pump Starts Today
LI2DMN	Input	Minimum Level from 2 Days ago
LI2MDX	Input	Maximum Level from 2 Days ago

Software Tag Function Descriptors

Code	Type	Description
LIT	Input	Level Indicating Transmitter
LITOMN	Input	Today's Level Minimum
LITOMX	Input	Today's Level Maximum
LIWF	Input	Lime Slaker Lime Inlet Weight Fault
LIYEMN	Input	Yesterday's Level Minimum
LIYEMX	Input	Yesterday's Level Maximum
LMAN	Input	Motor Local Manual Control Status
LMWT	Input	Lime Weight
LOAL	Input	Lockout Alarm
LOCK	Input	Lockout
LOCL	Input	Local
LOGC	Input	Controller A/B Logic Mismatch
LRUN	Input	Low Speed Running Status
LSHH	Input	Level Switch Hi-Hi
LSH	Input	Level Switch Hi
LSLL	Input	Level Switch Lo-Lo
LSL	Input	Level Switch Lo
LSTR	Input	Motor Low Speed Start Command
LVHH	Input	Level Hi-Hi
LVLB	Input	Level of Brine
LVLL	Input	Level Lo-Lo
LVLN	Input	Level of Salt
LVLQAI	Input	Level Data Quality
LVLX	Input	Level X Selected
LVR	Input	Voltage Low (e.g., battery)
LVRM	Input	Level Rate Mode (vs. Fixed Rate Mode)
LY	Input	Bubbler / Level Transmitter Fail
MAN	Input	Manual
MDBBD	Input	Modbus Baud
MDBDL	Input	Modbus Data Length
MDBDP	Input	Modbus Data Parity
MDBRT	Input	Modbus Retries
MDBSB	Input	Modbus Stop Bit
MDBTO	Input	Modbus Timeout
MDFT	Input	Frequency Timer Mode
MDSP	Input	Sludge Pump Mode (UFC Residual)
MIN	Input	Clock Minute
MLR	Input	Motor Lockout Relay
MNFL	Input	Manual Flow
MNPS	Input	Manual Position Mode

Software Tag Function Descriptors

Code	Type	Description
MNSP	Input	Manual Speed SP Mode
MNTN	Input	Maintenance Mode
MODALN	Input	Module (IO) Alarm
MODBD	Input	Modem Baud
MODDL	Input	Modem Data Length
MODDP	Input	Modem Data Parity
MODE	Input	Status or Mode
MODSB	Input	Modem Stop Bit
MONTH	Input	Clock Month
MPR	Input	Motor Protector Relay Alarm
MSIL	Input	Motor Manual Stop Interlock
NSH	Input	Hi Torque Alarm
NCR	Input	No Charge (e.g., battery)
NDST	Input	Output to No Destination (e.g., metering pumps)
NGR	Input	Negative Ground (e.g., battery)
NLRM	Input	None in Level Rate Mode Alarm (UFCs)
NMSTOP	Input	Normal Stop Cycle
NORM	Input	Normal (e.g., ATS Normal Power
NOTAVL	Input	Not Available
NOTK	Input	Standby Controller Not On LAN
NSH	Input	Hi Torque Switch
NSHH	Input	Hi-Hi Torque Alarm
NSHHH	Input	Drive Motor Cut Out Torque Alarm
NUMBR	Input	Telephone Number
OAAF	Input	Operator Adjustable Adjustment Factor (e.g., metering pump dose calculations)
OFAC	Input	Cycle Timer Off Accumulated Valve
OFF	Input	Off Status
OFFX	Input	Disable State X Command
OFLN	Input	Offline
OFPS	Input	Cycle Timer Off Preset
ON	Input	On / Running
ONAC	Input	Cycle Timer On Accumulated Value
OPEN	Input	Open Status
ONPS	Input	Cycle Timer On Preset
OPRM	Input	Open Permissive
OORAIX	Input	Out of Range for Analog Input Channel X
OORAOX	Input	Out of Range for Analog Output Channel X
OSRV	Input	Out of Service Command
OVLD	Input	Overload

Software Tag Function Descriptors

Code	Type	Description
PBSP	Input	Push Button Stop (e.g., LSPS)
PBST	Input	Push Button Start (e.g., LSPS)
PDAH	Input	High Differential Alarm
PFLD	Input	Power Factor Lead
PFLG	Input	Power Factor Lag
PFOL	Input	Power Factor Capacitor Overload
PGR	Input	Positive Ground Detect (e.g., battery charger)
PICK	Input	Pickup Coil
PING	Input	PING (e.g., PLC PING status)
PIT	Input	Pressure Indicating Transmitter
PMPX	Input	Pump X Selected
PNLF	Input	Front Panel Open
POLLCD	Input	Poll Command
POLLST	Input	Last Poll Status
PRTY	Input	Chemical Purity
PRMA	Input	Controller A is Primary
PRMB	Input	Controller B is Primary
PROC	Input	Motor Process Permissive
PSAC	Input	Parallel Source Active (e.g., SUB1)
PSAL	Input	Parallel Source Alarm (e.g., SUB1)
PSH	Input	Pressure Switch High
PSL	Input	Pressure Switch Low
PSTR	Input	Motor Pending Startup Status
PWRA	Input	Power Fail A
PWRB	Input	Power Fail B
QFEF	Input	Filters Effluent Flow Dosage Point
QRWF	Input	Raw Water Flow to Clarifiers Dosage Point
RAIXHD	Input	RTU Analog Point ‘X’ Health Diagnostic
RALL	Input	Remote Auto Lead-Lag Control Mode
RALM	Input	Resettable Alarm
RAPR	Input	Remote Auto Percentage mode
RAUT	Input	Motor Remoter Auto Control Status
RDY	Input	Equipment Ready Status
REFVLP	Input	Reference Voltage Positive
REFVLN	Input	Reference Voltage Negative
RIOP	Input	Global Communications RIO Health Fault
RKXFLT	Input	Rack Fault for Rack No. ‘X’
RMDXHD	Input	RTU Module ‘X’ Health Diagnostic Status
RMOT	Input	Remote
RSET	Input	Alarm Reset

Software Tag Function Descriptors

Code	Type	Description
RSME	Input	Resume Calculation Command
RTHI	Input	Runtime Hi Alarm
RTMH	Input	Rectifier High Temp Hi
RTODDT	Input	RTU Time Of Day – Date
RTODDY	Input	RTU Time Of Day – Day
RTODHR	Input	RTU Time Of Day – Hour
RTODMN	Input	RTU Time Of Day – Minute
RTODSC	Input	RTU Time Of Day – Second
RTODYR	Input	RTU Time Of Day – Year
RTS	Input	Return to Service
RUNA	Input	Running Alarm
RUNC	Input	Close Contactor is Energized (e.g., electric actuator)
RUNN	Input	Motor Running
RUNO	Input	Open Contactor is Energized (e.g., electric actuator)
RUNTIME	Input	Service Time Preset/Reset Value
RVSF	Input	RVSS (Reduced Voltage Solid-state Starter) Fault
RXXSTA	Input	Rack 0 Slot XX Status (OK)
S908	Input	Global Communications Health Fault
SAFE	Input	Motor Safety Permissive (Future)
SALM	Input	Alarm Exists
SAUT	Input	Motor Speed Auto Control Status
SBYA	Input	Controller A is Standby
SBYB	Input	Controller B is Standby
SCAN	Input	PLC Scan Time
SCLB	Input	Scale Buildup (Lime Slaker)
SCLH	Input	Scale Buildup High Alarm (Lime Slaker)
SEC	Input	Clock Seconds
SELX	Input	State X Selected
SHDN	Input	Shutdown Alarm
SHOL	Input	Space Heater Overload
SILK	Input	Motor Stop Interlock
SLTL	Input	Salt Tank Low
SOFF	Input	Selector Switch in OFF
SON	Input	Selector Switch in ON
SPRM	Input	Start Permissive
SRAM	Input	PLC State RAM
ST	Input	Speed Feedback
STBY	Input	Stand-by Status
STDN	Input	Shutdown

Software Tag Function Descriptors

Code	Type	Description
STEP	Input	Sequence Step
STLF	Input	Lifetime Starts
STRK	Input	Stroke
STRT	Input	Motor Start
STOP	Input	Motor / Valve Stop
STSEXD	Input	Starts Exceeded
STSEXB	Input	Starts Exceeded Bypassed
STTO	Input	Today's Starts
STYE	Input	Yesterday's Starts
SUCC	Input	Success
SURG	Input	Surge Alarm
SWAP	Input	PLC Swap Over Command
SYNC	Input	Sync Check Relay
TALM	Input	Temperature Alarm
TDAC	Input	Time Delay Off Accumulated Value
TEMP	Input	Temperature
TIMSTP	Input	Time Stamp
TGON	Input	Tagout On
TOC	Input	Truck Operated Contact (Vacuum Circuit Breaker)
TODFUL	Input	Time of Day Events Full
TODNUM	Input	Time of Day Events Number
TODSYN	Input	Synch RTU Clock to FEP
TOKN	Input	Token Rotation Time in secs
TOTL	Input	Total
TRBL	Input	Trouble (Malfunction) Alarm
TSH	Input	High Temperature Switch
TSL	Input	Low Temperature Switch
UFRV	Input	Unit Filter Run Volume
UPSB	Input	UPS Low Battery
UPSF	Input	UPS Fail
VFDA	Input	VFD Alarm
VFDT	Input	VFD Temperature Alarm
VFTC	Input	Valve Fail to close
VFTO	Input	Valve Fail to open
VSH	Input	High Vibration
VSHH	Input	High High Vibration
VSL	Input	Low Vibration
WALM	Input	Weight Alarm

Software Tag Function Descriptors

Code	Type	Description
WARN	Input	Warning
WIWF	Input	Water Inlet Weight Fault (Lime Slaker)
WSFL	Input	Weight Sensor Fault (e.g., Lime Slurry Aging Tank)
WY	Input	Weight Tared
XA	Input	Surge Suppressor Alarm
XFER	Input	Transfer Relay (e.g., initiates SUB1 transfer algorithm)
XHK	Input	Dosage Set point
XHLD	Input	Hold Calculation Status
XMTECD	Input	Transmit Error Code
XMTEND	Input	Transmit Error Node
XS	Input	General Switch Input
XSRV	Input	Filter In Service Status
XTND	Input	Filter Extend Backwash Notification
XTON	Input	Filter Extend Backwash On Status
XTOP	Input	Stop
XQI	Input	Current Day Start Count
XYSN	Input	Module Health Drop X Rack Y Slot N
YEAR	Input	Clock Year
ZA	Input	Valve Fail Alarm
ZDO	Input	Zero Dropout Value
ZS	Input	General Switch Input
ZSC	Input	Position switch close
ZSO	Input	Position switch open
ZT	Input	Position Feedback
AHK	Output	Remote Analyzer Setpoint
CLOS	Output	Equipment Close Coil
CYPS	Output	Cycle Preset Time Setpoint
DRPS	Output	Duration Preset Time Setpoint
FHK	Output	Flow Setpoint
FHKx	Output	Flow Setpoint, where x is a unique digit (when multiple setpoints used)
FIC	Output	Flow Controller Output
HSTR	Output	High Speed Start Coil
HXTP	Output	High Speed Stop Coil
KQC	Output	Runtime Reset Value
LHK	Output	Level Setpoint
LHKx	Output	Level Setpoint, where x is a unique digit (e.g., used in multi-level setpoints for tanks)

Software Tag Function Descriptors

Code	Type	Description
LSTR	Output	Low Speed Start Coil
LXTP	Output	Low Speed Stop Coil
MNRTSP	Output	Minimum Pump Runtime Setpoints
OFFSP	Output	Off Setpoint
ONFR	Output	Online Fixed Rate Mode Command
ONLR	Output	Online Level Rate Mode Command
ONSP	Output	On Setpoint
OPEN	Output	Equipment Open Coil
RNTRST	Output	Runtime Reset
RSET	Output	Reset Command
RST1	Output	Reset Service Runtime Command
RST2	Output	Reset Life Runtime Command
RVAL	Output	Equipment Runtime Preset Value
SHK	Output	Speed Setpoint
SHKx	Output	Speed Setpoint, where x is a unique digit (when multiple setpoints used)
SPBD	Output	Stop Blowdown Command
SRINSP	Output	Service Alarm Interval Setpoint
STBD	Output	Start Blowdown Command
STOP	Output	Stop Command
STRT	Output	Start Command
TGDT	Output	Tagout Date Setpoit
TGRN	Output	Tagout Reason Setpoint
TGRS	Output	Tagout Reset Command
TGST	Output	Tagout Set Command
TGTM	Output	Tagout Time Setpoint
TGUS	Output	Tagout User Setpoint
XFER	Output	Transfer Coil
XHK	Output	Dosage Setpoint
XHKx	Output	Dosage Setpoint, where x is a unique digit (when multiple setpoints used)
XRUN	Output	Motor Run / Stop Coil
XTOP	Output	Motor Stop Coil
ZHK	Output	Position Setpoint
ZHKx	Output	Position Setpoint, where x is a unique digit (when multiple setpoints used)
ZVC	Output	Valve Close Command
ZVO	Output	Valve Open Command
ZVC	Output	Valve Open / Close Coil

Table 3-4
Primary Qualifier Codes

Qualifier Code	Description
I	Field inputs to PLC.
O	Field outputs from PLC.
F	Filtered values/coils (used for existing software tag names only).
HI	Host inputs read from PLC.
HR	Host register read from/written to PLC.
M	Logic modified values/coils.
P	Peer-to-Peer points.
S	Scaled values.
DW	Host write to data source.
DR	Host read from data source.
PB	Primary Block.
CSB	Secondary Block.
LHI	Local Host (OIU) inputs read from PLC.
LHO	Local Host (OIU) outputs written to PLC.
LHR	Local Host (OIU) register read / wire to PLC

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SECTION 15061

PIPE SUPPORTS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Supports for pipe, fittings, valves, and appurtenances.

B. Provide all tools, supplies, materials, equipment, and labor necessary for the design, furnishing, construction, and installation of all pipe supports, hangers, guides, and anchors shown, specified, or required for a complete and operable piping system.

C. Piping supports for pipe 30″ and larger have been designed for the piping shown. Any modification to the piping, including the addition of flexible joints where not shown will require review and approval of the support system.

D. The absence of pipe supports, restraints and related details for pipes smaller than 30″ on the PLANS does not relieve the CONTRACTOR of the responsibility for providing them. Pipe supports and restraints shown on the PLANS, if any, are shown only to convey the design intent or where specific types and locations are required for a particular location and are not intended to represent a complete support system.

E. Piping supports for plumbing piping and specialties are not covered by this Specification.

1.02 RELATED REQUIREMENTS

A. Other related work as called for on PLANS or as specified elsewhere in this or other TECHNICAL SPECIFICATIONS section.

1.03 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.

ASTM INTERNATIONAL (ASTM)

A123	Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
A 380	Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
A575	Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
A 967	Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts.

MANUFACTURER'S STANDARDIZATION SOCIETY (MSS)

SP-58	Pipe Hangers and Supports - Materials, Design, and Manufacture.
SP-69	Pipe Hangers and Supports - Selection and Application.
SP-89	Pipe Hangers and Supports – Fabrication and Installation Practices.
SP-90	Guidelines on Terminology for Pipe Hangers and Supports.

FEDERAL SPECIFICATIONS (FS)

WWH-171 Hangers and Supports, Pipe.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

B31.1 Power Piping

UNDERWRITER'S LABORATORIES, INC. (UL)

UL-203 Pipe Hanger Equipment for Fire Protection Service.

1.04 (NOT USED)

1.05 SYSTEM DESCRIPTION

A. General:
   1. The intent of this Specification is that all process piping systems shown on the PLANS be provided with pipe hangers and supports.
   2. CONTRACTOR is responsible for the design of the pipe support system. Reference Paragraph 1.07 B.

B. Design Requirements:
   1. Select and design within the specified spans and component requirements.
   2. The absence of pipe supports and details on the PLANS does not relieve the CONTRACTOR of responsibility for sizing and providing supports as required for the process piping shown on the PLANS.
   3. Meet requirements of MSS SP-58.
   4. Structural Design Criteria:
      a. Dead loads imposed by the weight of the pipes and appurtenances filled with water plus any insulation.
      b. Safety factor: Minimum of 5.
   5. Design, size, and space support anchoring devices, including anchor bolts, inserts, and other devices used to anchor the supports to withstand the shear and pullout loads imposed by loading and spacing on each support.
   6. Framing Support System:
      a. Beams: Size such that beam stress does not exceed 25,000 psi and maximum deflection does not exceed 1/240 of the span.
      b. Column Members: Size in accordance with the manufacturer's recommended method.
      c. Support Loads: Determine based on pipes filled with water.
      d. Electrical Conduit Support: Include provision for electrical conduit routing in the design of the framing support system.
   7. The load rating for universal concrete inserts is not to be less than that of the hanger rods they support.

1.06 SUBMITTALS

A. Furnish the following in accordance with Specification Section 01300, "Submittals" and Section 01730, "Operation and Maintenance Data."
   1. Product Data: Submit product data characteristics, performance, limitations, and recommended uses.
   2. Manufacturer's Installation Instructions.
   3. Manufacturer's Compliance Certificate.
   4. Furnish drawings of all pipe supports, hangers, anchors, and guides. Drawings of each piping system locating each support, hanger, guide, or anchor. Installation details, materials, loads or forces and deflection of all hangers and supports.

5. Engineered hanger assemblies are to be detailed on 8½″ × 11″ sheets. Each sketch to include a location plan showing the location of the hanger in relation to columns and equipment.
6. Manufacturer's catalog data, literature, and engineering data for all hangers and supports.
7. Certificate of conformance as required in Paragraph 1.07-Quality Assurance.

1.07 QUALITY ASSURANCE

A. Obtain each type of pipe hanger or support from no more than one manufacturer.

B. Piping Support Design:
1. The design, computations, and detail drawings for the pipe supports and hangers are to be prepared by or under the direct supervision of a Professional Engineer registered in the State of Texas.
2. Piping support design engineer is to be ordinarily engaged in the design and analysis of pipe support systems.
3. The design engineer is to develop a detailed support system specific to the piping material, pipe joints, valves, piping appurtenances, system pressures and temperatures proposed as part of the Work.
4. Provide certificate signed and sealed by same engineer stating that the pipe support computations and pipe support drawings are in conformance with the design criteria.

1.08 DELIVERY, STORAGE AND HANDLING

A. Loose parts are to be shipped in crates that are clearly marked as to contents. Ship fabricated supports in largest sections permissible by carrier regulations.

B. All materials are to be inspected for size, quality and quantity upon delivery to site.

C. Store in a covered dry location until time of installation.

1.09 – 1.11 (NOT USED)

PART 2 PRODUCTS

2.01 GENERAL

A. Code Compliance: All piping systems and pipe connections to equipment to be properly supported, to prevent undue deflection, vibration, and stresses on piping, equipment, and structures. All supports and parts thereof to conform to the requirements of ASME B31.1, except as supplemented or modified by these Specifications.

B. Structural Members: Wherever possible, pipes are to be attached to structural members. Where it is necessary to frame structural members between existing members, such supplementary members to be provided by the CONTRACTOR at no additional cost to the OWNER. All supplementary members to be in accordance with the requirements of the building code and the American Institute of Steel Construction.

C. Support Spacing: Supports for piping with the longitudinal axis in approximately a horizontal position to be spaced to prevent excessive sag, bending and shear stresses in the piping, with special consideration given where components, such as flanges and valves, impose concentrated loads. Where calculations are not made or more stringent requirements from pipe manufacturers prevail, suggested maximum spacing of supports are given in the tables below. Vertical supports to be spaced to prevent the pipe from being overstressed from the combination of all loading effects.

D. Pipe Hangers: Pipe hangers to be capable of supporting the pipe in all conditions of operation, allow for free expansion and contraction of the piping, and prevent excessive

stress on equipment. All hangers to have a means of vertical adjustment after erection. Hangers to be designed so that they cannot become disengaged by any movement of the supported pipe. Hangers subject to shock, seismic disturbances, or thrust imposed by the actuation of safety valves, to include hydraulic shock suppressors.

E. Hangers Subject to Horizontal Movements: At hanger locations where lateral or axial movement is anticipated, suitable linkage to be provided to permit such movement. Where horizontal pipe movement is greater than ½-inch, or where the hanger rod deflection from the vertical is greater than 4 degrees from the cold to the hot position of the pipe, the hanger rod and structural attachment to be offset in such a manner that the rod is vertical in the hot position.

F. Spring-Type Hangers: Spring-type pipe hangers to be provided for piping subject to vibration or vertical expansion and contraction, such as engine exhausts and similar piping. All spring-type hangers to be sized to the manufacturer's printed recommendations and the loading conditions encountered. Variable spring supports to be provided with means to limit misalignment, buckling, eccentric loading, or to prevent overstressing of the spring, and with means to indicate at all times the compression of the spring. The support to be designed for a maximum variation in supporting effort of 25 percent for the total travel resulting from thermal movement.

G. Thermal Expansion: Wherever expansion and contraction of piping is expected, a sufficient number of expansion loops or joints to be provided, together with the necessary rolling or sliding supports, anchors, guides, pivots, and restraints. Design to allow the piping to expand and contract freely in directions away from the anchored points and to be structurally suitable to withstand all loads imposed.

H. Heat Transmission: Supports, hangers, anchors, and guides to be so designed and insulated, that excessive heat will not be transmitted to the structure or to other equipment.

I. Riser Supports: Where practical, risers to be supported on each floor with riser clamps and lugs, independent of the connected horizontal piping.

J. Freestanding Piping: Free-standing pipe connections to equipment, like chemical feeders, pumps, etc., to be firmly attached to fabricated frames made of angles, channels, or I-beams anchored to the structure. Exterior, free-standing overhead piping to be supported on fabricated pipe stands, consisting of pipe columns anchored to concrete footings, with horizontal, welded steel angles and U-bolts or clamps, securing the pipes.

K. Submerged Supports: All submerged or partially submerged piping to be supported with hangers, brackets, clips, or fabricated supports and anchors of Type 316 stainless steel, unless otherwise shown.

L. Point Loads: Any meters, valves, heavy equipment, and other point loads on PVC, fiberglass, and other plastic pipes, to be supported on both sides, according to manufacturer's recommendations to avoid undue pipe stresses and failures. To avoid point loads, all supports on plastic and fiberglass piping to be equipped with extra wide pipe saddles or galvanized steel shields.

M. Noise Reduction: To reduce transmission of noise in piping systems, all copper tubes in buildings and structures to be wrapped with a 2-inch wide strip of rubber fabric or similar, suitable material, at each pipe support, bracket, clip, or hanger.

N. Anchors: As specified in Section 05120, "Structural Steel".

2.02 MATERIALS

A. General:

1. Materials for Supports and Hangers: Materials for pipe supports and hangers to be as specified or shown on PLANS. When PLANS lack such information, hangers, supports, and anchor bolts to be manufactured/fabricated of the following materials:
    a. Type 304 or 316 stainless steel for locations as follows:
        1) Submerged.
        2) Less than 1 foot above the liquid surface.
        3) Below top of channel walls.
        4) Under covers or slabs of channels and tanks.
        5) Other damp locations.
        6) Field welding and fabrication of supports is prohibited.
        7) Shop-fabricated supports:
            a) Finish requirements: Remove free iron, heat tint oxides, weld scale, and other impurities, and obtain a passive finished surface.
            b) At the shop, perform pickling and passivation on all surfaces inside and out in accordance with ASTM A 380 or A 967.
    b. Passivation treatments using citric acid are not allowed. Hot dipped galvanized for all other locations. Hot-dip galvanize pipe supports after fabrication.
    c. Plastic, aluminum, FRP, and other miscellaneous materials: Use where specifically indicated on the Drawings.
2. Fabricate pipe supports of the correct material to the general configuration indicated by catalogs when specified items are not available in specified material.
3. Manufacturer's catalog/figure numbers are typical of the types and quality of pipe supports and hangers to be provided.
4. Special support and hanger details are shown to cover typical locations where standard catalog supports are inapplicable.
5. Furnish fabricated and standard hangers and supports complete with necessary inserts, bolts, nuts, rods, washers, and other accessories.
6. Run piping in groups and parallel to building lines where practical. Provide minimum clearance of 1-inch between pipe and other Work.
7. Install hangers and supports at all locations where piping changes direction.
8. All hangers and supports to be capable of adjustment after placement of piping.
9. Each type of hanger or support is to be the product of one (1) manufacturer. Types of hangers to be kept to a minimum.
10. Vertical Piping to be supported at each floor and between floors by stays or braces designed to prevent rattling and vibration.
11. Chain, wire, strap, or perforated bar hangers are not acceptable.
12. Piping may not be suspended from piping above it.
13. Provide thrust supports designed to be field adjusted and capable of restraining the loads generated by pipe movement due to expansion and contraction.
14. Provide intermediate or guide supports at intervals not exceeding 20 feet.
15. Guide supports to cradle the bottom 90 degrees of the pipe, and the bearing surface is to be contoured to fit the pipe.
16. Unless noted otherwise on PLANS, do not clamp piping to building surfaces; use offset supports.
17. Where concrete supports are shown, apply two (2) layers of 15-pound building felt under the pipe in contact with the concrete. Neatly trim felt around support.
18. Pitch piping to drain when shown on PLANS.
19. Provide lateral and longitudinal support as required to resist lateral loading such as wind.
20. Dissimilar Metals:
    a. Thin walled stainless steel piping is to be isolated from carbon steel by using stainless steel or fiberglass hangers or supports.

b. Prevent contact between dissimilar metals by using copper-plated, rubber or vinyl coated or stainless steel hangers or supports.

2.03 PIPE SUPPORTS

A. Hanger rods: Sized to match suspended pipe hanger, or as indicated on the Drawings:
1. Manufacturers: One of following or equal:
a. For stainless steel piping:
1) Bergen-Power, Figure 133.
2) Nibco-Tolco, Figure 103.
b. For all other piping, unless indicated on the Drawings:
1) Anvil International, Figure 140.
2) Bergen-Power, Figure 133.
3) Cooper B-Line Systems, Inc., Figure B3205.

B. Hanger rods, continuously threaded: Sized to match suspended pipe hanger, or as indicated on the Drawings:
1. Manufacturers: One of the following or equal:
a. For stainless steel piping:
1) Bergen-Power, Figure 94.
2) FM Stainless Fasteners.
b. For steel and ductile iron piping:
1) Anvil International, Figure 146.
2) Bergen-Power, Figure 94.

C. Eye bolts:
1. For stainless steel piping:
a. Type 316 stainless steel, welded and rated equal to full load capacity of rod.
2. For all other piping, unless indicated on the Drawings:
a. Welded and rated equal to full load capacity of rod.

D. Welded eyebolt rod:
1. Manufacturers: One of the following or equal:
a. For stainless steel piping:
1) Nibco-Tolco, Figure 101.
2) FM Stainless Fasteners.
b. For all other piping, unless indicated on the Drawings:
1) Anvil International, Figure 278.
2) Bergen-Power, Figure 93.
3) Cooper B-Line Systems, Inc., Figure B3210.

E. Adjustable ring hangers: MSS SP-69, Type 7 or Type 9 (system dependent):
1. Manufacturers: One of the following or equal:
a. For stainless steel piping:
1) Nibco-Tolco, Figure 1C.I.
2) Bergen-Power, Figure 100SS.
b. For all other piping, unless indicated on the Drawings:
1) Anvil International, Figure 97.
2) Cooper B-Line Systems, Inc., Figure B3172.

F. Adjustable clevis hangers: MSS SP-69, Type 1:
1. Manufacturers: One of the following or equal:
a. For stainless steel piping:
1) Cooper B-Line Systems, Inc, Figure B3100 or B3102.
2) FM Stainless Fasteners, Figure 60.
b. For all other piping, unless indicated on the Drawings:
1) Anvil International, Figure 260 or Figure 590.
2) Bergen-Power, Figure 100.
3) Cooper B-Line Systems, Inc., Figure B3100 or B3102.

G. Adjustable clevis hangers for insulated pipe: Oversize:
1. Manufacturers: One of the following or equal:
a. For stainless steel piping:
1) Nibco-Tolco, Figure 1A.
b. For all other piping, unless indicated on the Drawings:
1) Anvil International, Figure 300.
2) Bergen-Power, Figure 100EL.
3) Cooper B-Line Systems, Inc. Figure B3108.

H. Brackets: MSS SP-69, Type 32 with back plate; rated for 1,500 pounds:
1. Manufacturers: One of the following or equal:
a. For stainless steel piping:
1) Nibco-Tolco, Figure 30M.
2) Cooper B-Line Systems, Inc., Figure B3066.
3) FM Stainless Fasteners, Figure 98.
b. For all other piping, unless indicated on the Drawings:
1) Anvil International, Figure 195.
2) Cooper B-Line Systems, Inc., Figure B3066.

I. Brackets, heavy duty: MSS SP-69, Type 33 with back plate; rated for 3,000 pounds:
1. Manufacturers: One of following or equal:
a. Anvil International, Figure 199.
b. Cooper B-Line Systems, Inc., Figure B3067.

J. Standard U-bolt: MSS SP-69, Type 24:
1. Manufacturers: One of the following or equal:
a. For stainless steel piping:
1) Nibco-Tolco, Figure 110.
2) Cooper B-Line Systems, Inc., Figure B3188.
3) FM Stainless Fasteners, Figure 37.
b. For all other piping, unless indicated on the Drawings:
1) Anvil International, Figure 137.
2) Bergen-Power, Figure 283.
3) Cooper B-Line Systems, Inc., Figure B3188.

K. Riser clamps: MSS SP-69, Type 8:
1. Manufacturers: One of the following or equal:
a. For stainless steel piping:
1) Cooper B-Line Systems, Inc., Figure B3373.
2) FM Stainless Fasteners, Figure 61.
b. For all other piping, unless indicated on the Drawings:
1) Anvil International, Figure 261.
2) Bergen-Power, Figure 126.
3) Cooper B-Line Systems, Inc., Figure B3373.

L. Pipe clamps: MSS SP-69, Type 4:
1. Manufacturers: One of the following or equal:
a. For stainless steel piping:
1) Nibco-Tolco, Figure 4.
2) Cooper B-Line Systems, Inc., Figure 3140.
b. For all other piping, unless indicated on the Drawings:
1) Anvil International, Figure 212.
2) Bergen-Power, Figure 175.
3) Cooper B-Line Systems, Inc., Figure B3140.

M. Adjustable offset pipe clamp:
1. Manufacturers: One of the following or equal:
a. For stainless steel piping:
1) Nibco-Tolco, Figure 4.

2) Cooper B-Line Systems, Inc., Figure B3149.
3) FM Stainless Fasteners, Figure 63.

b. For all other piping, unless indicated on the Drawings:
1) Anvil International, Figure 100.
2) Cooper B-Line Systems, Inc., Figure B3149.

N. Offset pipe clamp:
1. Manufacturers: One of the following or equal:
a. For stainless steel piping:
1) Nibco-Tolco, Figure 8.
2) Cooper B-Line Systems, Inc., Figure 3148.
b. For all other piping, unless indicated on the Drawings:
1) Anvil International, Figure 103.
2) Cooper B-Line Systems, Inc., Figure B3148.

O. Floor stand or stanchion saddles: MSS SP-69, Type 37. Provided with U-bolt hold down yokes:
1. Manufacturers: One of the following or equal:
a. For stainless steel piping:
1) Nibco-Tolco, Figure 318.
2) FM Stainless Fasteners, Figure 59.
b. For all other piping, unless indicated on the Drawings:
1) Anvil International, Figure 259.
2) Bergen-Power, Figure 125.
3) Cooper B-Line Systems, Inc., Figure B3090.

P. Spring hangers:
1. Manufacturers: One of the following or equal:
a. For stainless steel piping:
1) Bergen-Power, Figure 920.
b. For all other piping, unless indicated on the Drawings:
1) Anvil International, Figure B-268, Type G.
2) Bergen-Power, Figure 920.

Q. One hole pipe clamps:
1. Manufacturers: One of the following or equal:
a. For stainless steel piping:
1) Not used.
b. For all other piping:
1) Anvil International, Figure 126.
2) Carpenter & Paterson, Figure 237S.

R. Welded beam attachment: MSS SP-69, Type 22:
1. Manufacturers: One of the following or equal:
a. For stainless steel piping:
1) Nibco-Tolco, Figure 304.
2) Cooper B-Line Systems, Inc., Figure 3083.
b. For all other piping, unless indicated on the Drawings:
1) Anvil International, Figure 66.
2) Bergen-Power, Figure 113A or 113B.
3) Cooper B-Line Systems, Inc., Figure B3083.

S. Heavy pipe clamp: MSS SP-69, Type 4:
1. Manufacturers: One of the following or equal:
a. For stainless steel piping:
1) Nibco-Tolco, Figure 4H.
b. For all other piping, unless called out otherwise on the Drawings:
1) Anvil International, Figure 216.
2) Bergen-Power, Figure 298.

T. PTFE pipe slide assembly: MSS SP-58, Type 35 with lateral and vertical restraint:
   1. Manufacturers: One of the following or equal:
      a. For stainless steel piping:
         1) Nibco-Tolco, Figure 426.
      b. For all other piping, unless indicated on the Drawings:
         1) Anvil International, Figure 257, Type 3.
         2) Cooper B-Line Systems, Inc., Figure B3893.

PART 3 EXECUTION

3.01 GENERAL

A. General: All pipe supports, hangers, brackets, anchors, guides, and inserts to be fabricated and installed in accordance with the manufacturer's printed instructions and ANSI/ASME B31.1. All concrete inserts for pipe hangers and supports to be coordinated with the formwork.

B. Appearance: Pipe supports and hangers to be positioned in such a way as to produce an orderly, neat piping system. All hanger rods to be vertical, without offsets. Hangers to be adjusted to line up groups of pipes at the proper grade for drainage and venting, as close to ceilings or roofs as possible, without interference with other work.

C. All supports to be securely fastened.

3.02 PREPARATION

A. Locate hangers, supports and accessories to support piping, valves and at all concentrated loads.

B. Locate hangers, supports and accessories within maximum span lengths specified to support continuous pipeline runs.

C. Locate hangers and supports to prevent vibration or swaying and to provide for expansion and contraction.

D. Install items to be embedded before concrete placement.

E. Fasten embedded items securely to prevent movement during concrete placement.

F. Install hanger and support units on piping systems as recommended by manufacturer.

G. Adjust hangers and supports and place grout for concrete supports to bring pipelines to specified elevations.

3.03 INSTALLATION

A. Properly support, suspend, or anchor exposed pipe, fittings, valves, and appurtenances to prevent sagging, overstressing, or movement of piping; and to prevent thrusts or loads on or against connected pumps, blowers, and other equipment.

B. Field verify support location, orientation, and configuration to eliminate interferences prior to fabrication of supports.

C. Carefully determine locations of inserts. Anchor to formwork prior to placing concrete.

D. Use flush shells only where indicated on the PLANS.

E. Do not use anchors relying on deformation of lead alloy.

F. Do not use powder-actuated fasteners for securing metallic conduit larger than 1 inch to concrete, masonry, or wood.

G. Suspend pipe hangers from hanger rods and secure with double nuts.

H. Install continuously threaded hanger rods only where indicated on the PLANS.

I. Use adjustable ring hangers or adjustable clevis hangers, for 4 inch and smaller diameter pipe.

J. Use adjustable clevis hangers for pipe larger than 4 inches in diameter.

K. Secure pipes with double nutted U-bolts or suspend pipes from hanger rods and hangers.
1. For stainless steel piping, use stainless steel U-bolts.
2. For all other piping, use galvanized U-bolts.

L. Support spacing:
1. Support 2-inch and smaller piping on horizontal and vertical runs at maximum 5 feet on center, unless otherwise specified.
2. Support larger than 2-inch piping on horizontal and vertical runs at maximum 10 feet on center, unless otherwise specified.
3. Support exposed polyvinyl chloride and other plastic pipes at maximum 5 feet on center, regardless of size.
4. Support tubing, copper pipe and tubing, fiber-reinforced plastic pipe or duct, and rubber hose and tubing at intervals close enough to prevent sagging greater than 1/4 inch between supports.
5. For welded, fabricated steel pipe sizes not used in this table, the support spacing to be designed so that the stress on the pipe does not exceed 5,000 psi. This may be calculated by using the formula:

$$L = \frac{7{,}500\,tD}{32t + D}$$

where: t = Thickness, in.
D = Diameter, in.
L = Safe Span, ft.

M. Maximum deflection of pipe to be limited to 1/360th of the span.

N. Install supports at:
1. Horizontal bends.
2. Both sides of flexible pipe connections.
3. Base of risers.
4. Floor penetrations.
5. Connections to pumps, blowers, and other equipment.
6. Valves and appurtenances.

O. Securely anchor plastic pipe, valves, and headers to prevent movement during operation of valves.

P. Anchor plastic pipe between expansion loops and direction changes to allow axial movement through anchors.

Q. Provide elbows or tees supported from floors with base fittings where indicated on the Drawings.

R. Support base fittings with metal supports or when indicated on the PLANS support on concrete piers.

S. Do not use chains, plumbers' straps, wire, or similar devices for permanently suspending, supporting, or restraining pipes.

T. Support plumbing drainage and vents in accordance with applicable local plumbing code.

U. Supports, clamps, brackets, and portions of support system bearing against copper pipe: Copper plated, copper throughout, or isolated with neoprene or polyvinyl chloride tape.

V. Where pipe is insulated, install over-sized supports and hangers.

W. Install insulation shield in accordance with MSS SP-69, Type 40. Shield shall be galvanized steel unless otherwise specified or indicated on the PLANS.

X. Install riser clamps at floor penetrations and where indicated on the PLANS.

Y. Coat support system components as specified in Section 09902, “Paint and Protective Coatings”.

3.04 – 3.10 (NOT USED)

3.11 MEASUREMENT AND PAYMENT

Unless otherwise indicated, no separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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SECTION 15075

MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.01 SUMMARY

A. Furnish, mark, and install identification devices for all mechanical equipment, ducts, exposed piping, and valves using color bands, lettering, flow direction arrows, and related permanent identification devices, as specified herein. Mark existing equipment, ducts, piping, and valves when indicated on PLANS.

1.02 RELATED REQUIREMENTS

A. Other related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATION Sections.

1.03 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.

AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)

ANSI A13.1	Scheme for the Identification of Piping Systems.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D709	Standard Specification for Laminated Thermosetting Materials

1.04 DEFINITIONS (NOT USED)

1.05 SYSTEM DESCRIPTION

A. Types of identification devices specified in this Section include the following:
1. Equipment Nameplates
2. Painted Identification Materials.
3. Plastic Pipe Markers.
4. Plastic Tape.
5. Valve Tags.
6. Valve Schedule Frames.
7. Engraved Plastic-Laminate Signs.
8. Plasticized Tags.
9. Special Items.
10. Underground Warning Tape

1.06 SUBMITTALS

A. Furnish the following in accordance with Specification Section 01300, “Submittals” and Section 01730, “Operation and Maintenance Data”.
1. In addition to the items specified in Section 01300 “Submittals”, furnish the following information:
a. Product data: Manufacturer’s technical data and installation instructions for each identification material and device required.
b. Samples: Of all types and of each color, lettering style and other graphic representation required for each identification material or system to be used in the work.
c. A list of suggested wording for all valve tags prior to fabrication.

1.07 QUALITY ASSURANCE

A. Regulatory requirements:
   1. Comply with Texas Commission on Environmental Quality (TCEQ):
      a. Chapter 217 – Design Criteria for Wastewater Systems
      b. Chapter 290 – Public Drinking Water.
   2. Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.08 DELIVERY, STORAGE AND HANDLING

A. Delivery products to site in factory packed boxes or crates.

B. Store inside. Protect from weather and damage until installed.

1.09 – 1.11 (NOT USED)

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with the requirements of this Section, provide mechanical identification materials from one of the following manufacturers.
   1. Allen Systems, Inc.
   2. Brady (W.H.) Co.; Signmark Div.
   3. Industrial Safety Supply Co., Inc.
   4. Seton Name Plate Corp.

2.02 MATERIALS AND/OR EQUIPMENT

A. General: Provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for application, selection is installer's option, but provide single selection for each product category.

B. Equipment Nameplates
   1. Material and fabrication:
      a. Stainless steel sheet engraved or stamped with text, holes drilled, or punch for fasteners.
   2. Fasteners:
      a. Number 4 or larger oval head stainless steel screws or drive pins.
   3. Text:
      a. Manufacturer's name, equipment model number and serial number, identification tag number; and when appropriate, drive speed, motor horsepower with rated capacity, pump rated total dynamic head, and impeller size.

C. Painted Identification Materials:
   1. Stencils: Standard metal stencils, prepared for required applications with letter sizes generally complying with recommendations of ANSI A13.1 for piping and similar applications, but not less than 1¼″ high letters for ductwork and not less than 3/4″ high letters for access door signs and similar operational instructions.
   2. Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray-can form and grade.
   3. Identification Paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ANSI A13.1 for colors.

D. Plastic Pipe Markers:
   1. Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color-coded pipe markers, complying with ANSI A13.1.

2. Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, complying with ANSI A13.1.
3. Insulation: Furnish 1″ thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on non-insulated pipes subjected to fluid temperatures of 125°F (52°C) or greater. Cut length to extend 2″ beyond each end of plastic pipe marker.
4. Small Pipes: For external diameters less than 6″ (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
    a. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
    b. Adhesive lap joint in pipe marker overlap.
    c. Laminated or bonded application of pipe marker to pipe (or insulation).
    d. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4″ wide; full circle at both ends of pipe marker, tape lapped 1½″.
5. Large Pipes: For external diameters of 6″ and larger (including insulation if any), provide either full-band or strip-type pipe markers, but not narrower than 3 times letter height (and of required length), fastened by one of the following methods:
    a. Laminated or bonded application of pipe marker to pipe (or insulation).
    b. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 1½″ wide; full circle at both ends of pipe marker, tape lapped 3″.
    c. Strapped-to-pipe (or insulation) application of semi-rigid type, with manufacturer's standard stainless steel bands.
6. Lettering: Comply with piping system nomenclature as specified, scheduled or shown, and abbreviate only as necessary for each application length.
    a. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as a separate unit of plastic.

E. Plastic Tape:
1. General: Provide manufacturer's standard color-coded pressure-sensitive (self-adhesive) vinyl tape, not less than 3 mils thick.
2. Width: Provide 1½″ wide tape markers on pipes with outside diameters (including insulation, if any) of less than 6″, 2½″ wide tape for larger pipes.
3. Color: Comply with ANSI A13.1, except where another color selection is indicated.

F. Valve Tags:
1. Provide 2″ diameter, 0.025″ thick, polished stainless steel valve tags with 3/16″ hole for mounting.
2. Marking:
    a. Scheduled Valves: Tags are to be stamped or engraved with the tag number listed in the valve schedule:
        1) First Line: Area code.
        2) Second Line: Equipment code.
        3) Third Line: Unit code.
        4) Lettering Height: 1/8″.
    b. Unscheduled Valves: Tags are to describe the service with a sequential number:
        1) First Line: Service - 1/4″ high lettering.
        2) Second Line: Sequential number - 1/2″ high lettering.
    c. Fill tag engraving with black enamel.

3. Valve Tag Fasteners:
    a. Stainless steel screws;
    b. Stainless steel nuts and bolts;
    c. Stainless steel wire (1/16″) with swagged terminations;
    d. No. 6 stainless steel beaded chain; or
    e. No. 16 stainless steel jack chain.
4. Access Panel Markers: Provide manufacturer's standard 1/16″ thick engraved plastic laminate access panel markers, with abbreviations, and numbers corresponding to concealed valve, unless otherwise required by code. Include 1/8″ center hole to allow attachment.

G. Valve Schedule Frames:
1. General: For each page of valve schedule, provide glazed display frame, with screws for removable mounting on masonry walls. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.

H. Engraved Plastic-Laminate Signs:
1. General: Provide engraving stock melamine plastic laminate, complying with ASTM D709, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
2. Thickness: 1/16″ for units up to 20 sq.in. or 8″ length; 1/8″ for larger units.
3. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

I. Plastic Equipment Markers:
1. General: Provide manufacturer's standard laminated plastic, color-coded equipment markers. Conform to the following color code.
    a. Green: Cooling equipment and components.
    b. Yellow: Heating equipment and components.
    c. Yellow/Green: Combination cooling and heating equipment and components.
    d. Brown: Energy reclamation equipment and components.
    e. Blue: Equipment and components that do not meet any of the above criteria.
    f. For hazardous equipment, use colors and designs recommended by ANSI A13.1.
2. Nomenclature: Include the following, matching terminology on schedules as closely as possible.
    a. Name and plan number.
    b. Equipment service.
    c. Design capacity.
    d. Other design parameters such as pressure drop, entering and leaving conditions, rpm, etc.
3. Size: Provide approximate 2½″ × 4″ markers for control devices, dampers and valves; and 4½″ × 6″ for equipment.

J. Lettering and Graphics:
1. General: Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.
    a. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service (e.g., Boiler No. 3, Air Supply No. 1H, Standpipe F12).

K. Special Items
1. In addition, special coating of following items will be required:

Item	Color
Hoist hooks and blocks	Yellow and black stripes
Steel guard posts	In accordance with standard details

L. Underground Warning Tape
1. Material:
a. Metallic detection tape; minimum 4 mil thick by 6 inches wide polyethylene film with wording, “Caution” with name of service followed by words, “Line Buried Below” repeated continuously along tape length, with alternate metallic and color strips.

2.03 EXTRA STOCK

A. Furnish minimum of 5% extra stock of each mechanical identification material required, including additional numbered valve tags (not less than 3) for each piping system, additional piping system identification markers, and additional plastic laminate engraving blanks of assorted sizes.
1. Where stenciled markers are provided, clean and retain stencils after completion of stenciling and include used stencils in extra stock, along with required stock of stenciling paints and applicators.

PART 3 EXECUTION

3.01 GENERAL

A. Install all labels and identification tags in accordance with the manufacturer’s printed instructions. Appearance to be neat and uniform. Tags and/or labels to be readily visible from normal working locations.

B. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.02 PREPARATION

A. Prepare and coat surfaces as Specified in Contract documents.

B. Prepare surface in accordance with product manufacturer's instructions.

3.03 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

A. Existing Identification Systems: In installations where existing piping identification systems have been established, continue to use the existing system. Where existing identification systems are incomplete, utilize the existing system as far as practical and supplement with the specified system. The objective is to fully identify all new equipment, piping, valves, and appurtenances to the level specified herein.

B. Piping System Identification:
1. General: Pipe identification to consist of 4 elements - 2 color-coded bands, a lettered label, and a flow arrow to indicate direction of flow in the pipe. Color bands to be painted directly upon the pipe or of the pressure-sensitive, adhesive-backed, vinyl cloth or plastic tape type. Labels to be preprinted on pressure-sensitive, adhesive-backed, vinyl cloth or plastic tape. Arrows to be die-cut of the same type of material as the labels. Arrange bands so that the lettered label and the directional arrow are placed between the 2 bands. Install pipe markers of

one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow.

a. Stenciled markers, including color-coded background band or rectangle, and contrasting lettering of black or white. Extend color band or rectangle 2″ beyond ends of lettering.
b. Letter sizes and colors for lettering, arrows, and background to conform to ANSI A13.1.
c. Plastic pipe markers, with application system as indicated under "Materials" in this Section. Install on pipe insulation segment where required for hot non-insulated pipes.
d. Stenciled markers, black or white for best contrast, wherever continuous color-coded painting of piping is provided.

2. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
   a. Near each valve and control device.
   b. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
   c. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
   d. At access doors, manholes and similar access points which permit view of concealed piping.
   e. Near major equipment items and other points of origination and termination.
   f. Piping to be identified at intervals of 20 feet, and at least one time in each room. Identify piping at a point approximately within 2 feet of all turns, ells, valves, and on the upstream side of all distribution fittings or branches. Sections of pipe that are too short to be identified with color bands, lettered labels, and directional arrows are to be tagged and identified similar to valves.
   g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.
3. Sections of pipe that are too short to be identified with color bands, lettered labels, and arrows are to be identified with metal or plastic tags as specified herein.

C. Valve Identification:
1. General: Provide valve tag on every valve, cock and control device in each piping system; exclude valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibs, and shut-off valves at plumbing fixtures, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system.
2. Valve tags are to be permanently attached to the valve as follows:
   a. Valves 12-inches and Smaller: Attach tag to valve with SS beaded chain, SS jack chain, or SS wire.
   b. Valves Larger than 12-inches: Attach tag to valve using SS screw(s) or SS nuts and bolts.
3. Mount valve schedule frames and schedules in rooms where indicated or, if not otherwise indicated, where directed by ENGINEER.
   a. Where more than one major machine room is shown for project, install mounted valve schedule in each major machine room, and repeat only main valves which are to be operated in conjunction with operations of more than single machine room.

D. Equipment Identification:
1. General: Install engraved plastic laminate sign or plastic equipment marker on or near each major item of mechanical equipment and each operational device, as

specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:

a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
b. Meters, gages, thermometers and similar units.
c. Fuel-burning units including boilers, furnaces, heaters, stills and absorption units.
d. Pumps, compressors, chillers, condensers and similar motor-driven units.
e. Heat exchangers, coils, evaporators, cooling towers, heat recovery units and similar equipment.
f. Fans, blowers, primary balancing dampers and mixing boxes.
g. Packaged HVAC central-station or zone-type units.
h. Tanks and pressure vessels.
i. Strainers, filters, humidifiers, water treatment systems and similar equipment.

2. Optional Sign Types: Where lettering larger than 1″ height is needed for proper identification, because of distance from normal location of required identification, stenciled signs may be provided in lieu of engraved plastic, at installer's option.
3. Lettering Size: Minimum 1/4″ high lettering for name of unit where viewing distance is less than 2′-0″, 2″ high for distances up to 6′-0″, and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 to 3/4 of size of the principal lettering.
4. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
   a. Operational valves and similar minor equipment items located in non-occupied spaces (including machine rooms) may, at installer's option, be identified by installation of plasticized tags in lieu of engraved plastic signs.

3.04 – 3.05 (NOT USED)

3.06 ADJUSTING

A. Relocate any mechanical identification device which has become visually blocked by work of other divisions.

3.07 CLEANING

A. Clean face of identification devices, and glass frames of valve charts.

3.08 - 3.10 (NOT USED)

3.11 MEASUREMENT AND PARMENT

No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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SECTION 15082

PIPING INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes: furnishing and installing insulation for water piping, chemical piping, instrument tubing containing water, and piping up to 6” in diameter subject to condensation.

1.02 RELATED REQUIREMENTS

A. Other related work as called for on PLANS or specified elsewhere in this or other TECHNICAL SPECIFICATION Sections.

1.03 - 1.05 (NOT USED)

1.06 SUBMITTALS

A. Furnish the following in accordance with Specification Section 01300, “Submittals” and Section 01730, “Operation and Maintenance Data”.
   1. In addition to the items specified in Section 01300 “Submittals”, furnish the following information:
      a. Submit bulletins and certified data describing materials to be used for insulation. Include manufacturer's printed installation instructions.

1.07 QUALITY ASSURANCE (NOT USED)

1.08 DELIVERY, STORAGE AND HANDLING

A. All insulation components to be delivered, stored and handled per manufacturer's printed instructions.

1.09 - 1.11 (NOT USED)

PART 2 - PRODUCTS

2.01 MANUFACTURER(S)

A. Insulation: Owens Corning Fiberglass, Knauf Fiber Glass, or Certainteed.
B. Exterior Service Weather Jacket: Premetco or Childers Products Co.

2.02 MATERIALS AND/OR EQUIPMENT

A. General: All insulation system components to be asbestos free.

B. Pipe Insulation: Molded heavy density one-piece insulation made from inorganic glass fibers bonded with a thermo-setting resin. Insulation to include an all service jacket (ASJ) with vapor barrier, a self sealing lap (SSL) for longitudinal joint, and similar factory furnished butt joint sealing strip. Minimum insulation thickness to be one inch for pipes 2-inches and smaller, two inches for lines 2-inches and larger.

C. Weather Jacket: All exterior insulation to be protected by minimum 0.016-inch thick aluminum jacket with laminated vapor barrier of polyethylene-surlyn or polyethylene-Kraft

paper thermally bonded to the inside surface. Valve, fittings, and flanges to have equal jacketing and moisture barrier protection.

D. Vapor Barrier Sealant: Non-shrinking permanently flexible vapor barrier sealant, Childers CP-70 or equal.

E. Strapping: Stainless steel bands, minimum 0.020-inch thick by 3/4-inch wide with 0.034-inch thick wing seals.

2.03 - 2.04 (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

A. Pipes and tubing 8 inches and smaller to be insulated when exposed to outside temperatures. All hot water lines 1/2-inch and larger to be insulated. See PLANS for piping to be insulated for prevention of condensation.

B. Furnish all accessories required to complete the work.

3.02 PREPARATION (NOT USED)

3.03 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

A. Install insulation after piping has been installed, tested, and painted. Install in neat manner, following manufacturer's printed instructions. All fittings and valves to be carefully insulated and sealed. All joints to be completely waterproof. Use only workman skilled in this trade.

B. Pipe Insulation: Butt all joints firmly together and secure self-seal lap in accordance with manufacturer's recommendations. Ends of pipe insulation to be sealed with vapor barrier sealant at all fittings, valves, and intervals not exceeding 21 feet on straight run pipe.

C. Valves and Fittings: Preformed insulation and fitting covers to be used where possible. Where necessary, segments of pipe insulation to be carefully fitted, secured by 20 gauge corrosion resistant wire, and finished with vapor barrier sealant, so as not to interfere with operation of valve actuator.

D. Weather Jacket: Piping, valves, and fittings to be protected by preformed aluminum jacketing with vapor barrier installed in accordance with manufacturer's recommendations. All joints to be made watertight with sealant.

E. Termination: Insulation to extend 6 inches below finish grade and terminate flush with all walls and slabs. All termination points to be completely waterproof.

F. Wall Penetrations: Seal all voids between wall penetrations and completed pipe insulation system.

3.04 - 3.10 (NOT USED)

3.11 MEASUREMENT AND PAYMENT

No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

SECTION 15172

ELECTRICAL MOTOR, HIGH EFFICIENCY, HORIZONTAL INDUCTION, 300 HP & SMALLER

PART 1 GENERAL

1.01 SUMMARY

A. Furnish and install mill and chemical horizontal high efficiency, squirrel cage induction motor; Design B, normal starting current and torque; furnish as integral part of rotating equipment unit. Motor to be most premium efficient type available from motor manufacturer.

1.02 RELATED REQUIREMENTS

A. PLANS, this and other TECHNICAL SPECIFICATION Sections, and equipment manufacturer requirements define voltage, speed, special features, driven equipment requirements, and special submittal data.

B. Related work as called for on PLANS or specified in this or other TECHNICAL SPECIFICATION Sections.

1.03 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)

ABMA 9	Load Ratings and Fatigue Lift for Ball Bearings

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE)

IEEE 112	Standard Test Procedures for Polyphase Induction Motors and Generators
IEEE 841	Standard for Petroleum and Chemical Industry – Severe Duty Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors – Up to and Including 500 HP

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	Motors and Generators

1.04 - 1.05 (NOT USED)

1.06 SUBMITTALS

A. Furnish the following in accordance with Specifications Section 01300, “Submittals” and Section 01730, “Operation and Maintenance Data”.
   1. Shop Drawings. In addition to the items specified in Section 01300, “Submittals”, furnish the following information:
      a. Full nameplate information in accordance with NEMA Standard MG-1; full load and locked rotor torque; and efficiency and power factor data at full load, ¾ load, and ½ load.

b. When power factor correction capacitor is provided in motor circuit, all nameplate information affected by addition of capacitor to be corrected and submitted in addition to information described herein.
c. Speed torque characteristics, inertia, safe stall time, and thermal damage curves.
d. Number of allowable starts (cold/hot) per day and associated time between successive starts.
e. Space heater voltage and wattage.
f. Bearing size and calculation.
g. Data to be included on nameplate.
h. Dimensioned outlined drawings.
i. Net weight of assembled motor and net weight of heaviest part to be handled during field assembly or disassembly.
j. When power factor correction capacitors are required, include to-scale arrangement drawings showing configurations of capacitor inside the high voltage termination box.
k. Full load amperes (FLA), no load amperes, and locked rotor amperes (LRA) at rated voltage.
l. Motor and space heater wiring diagrams.

2. Operation and Maintenance Manuals: Furnish in accordance with Contract Documents. Manuals to contain speed-torque, inertia, safe stall time (thermal damage) and acceleration curves also.
3. Reports: Submit certified tests for review by the ENGINEER prior to shipment.

1.07 QUALITY ASSURANCE

A. Latest edition of NEMA Standard MG-1and applicable provisions of IEEE, ANSI, NEC, OSHA, and UL.

B. Furnish identical motors and accessories from a single motor manufacturer for multiple units of the same equipment.

C. Sole Source Responsibility: Utilize a single supplier to provide the drive motor, the motor mounts and any accessories.

1.08 DELIVERY, STORAGE AND HANDLING

A. Protect from weather and insects with polyethylene wrapper; furnish and energize space heaters to preclude moisture.

1.09 - 1.11 (NOT USED)

PART 2 PRODUCTS

2.01 MANUFACTURER(S)

A. Teco-Westinghouse;
B. General Electric;
C. U.S. Motor-Corro Duty Energy Efficient;
D. Reliance-High Performance Type XE;

2.02 MATERIALS AND/OR EQUIPMENT

A. Performance: Unless otherwise noted in the driven equipment specification sections, the following items apply as a default standard:

1. Brake Horsepower: As designated in driven equipment specifications. Brake horsepower of the driven equipment is not to exceed the motor nameplate horsepower rating, excluding any service factor.
2. Power Factor (as required by applicable Specification Section and/or as shown on PLANS):
   a. Minimum full load power factor (uncorrected): 85 percent.
   b. When noted on PLANS, corrected minimum full load power factor: 95 percent.
3. Minimum Efficiency at Rating: Motors to be of a premium energy-efficient design per NEMA MG-1, 2006, Tables 12-12 and 12-13.
4. Maximum Locked Rotor Indicating Code Letter: G for motors sized 15 horsepower and larger.

B. Application: Unless otherwise designated in the Driven Equipment Specification, furnish the following:
1. Enclosure: TEFC.
2. Service Factor: 1.15.
3. Mounting: As required by the driven equipment.
4. 120-volt space heaters.
5. Starting: Across the line, full voltage starting except motors larger than 50 HP to be suitable for reduced voltage starting using reduced voltage auto-transformer starting, with reduced voltage auto-transformer tap setting of 65 percent of the across-the-line voltage.
6. Duty Rating: Continuous.
7. Frequency: 60 Hz.
8. Lifting: Lug.

C. Construction and Materials:
1. Frame: Cast iron, size per NEMA designations.
2. End Shields/Brackets: Cast iron.
3. Drain/Breather: Stainless steel “T” drains in end brackets.
4. Fan Shroud: Cast iron.
5. Motor Terminal Box: Oversize, cast iron, diagonally split, rotatable, threaded hubs for conduit attachment. Sized per NEMA MG 1, Section 1, Paragraph 4.19. Terminal box to be gasketed to frame and furnished with grounding lug.
6. Cooling Fan: Aluminum or polypropylene.
7. Wiring and Insulation: Copper with non-hygroscopic Class F insulation, Class B temperature rise not to exceed insulation temperature rating when operating at service factor rating in 40°C ambient according to NEMA MG 1-12.42. Include extra dips and bakes for high humidity.
8. Rotor: Precision cast aluminum conductor bars, statically and dynamically balanced.
9. Bearings: Ball bearings, B_{10} life of 75,000 hours per ABMA 9, grease lubricated with cast iron bearing caps. Labyrinth sealed with removable grease relief plugs. Extended lubrication lines with Alemite fittings in both end shields. Provide for adding new and draining old grease without major motor disassembly.
10. Hardware: Stainless steel.
11. Shaft: High strength carbon steel, precision turned and ground. Non-metallic V-ring shaft slinger to prevent moisture seepage along shaft into motor.
12. Power Factor Correction Capacitors (as required by applicable Specification Section and/or when shown on PLANS): Furnish capacitors of the greatest KVAR rating recommended by motor manufacturer for switching with motor. Capacitors to be provided with appropriate drain resistors per NEC and located inside motor terminal box. Furnish oversize terminal box when capacitors are required.
13. Provide internal temperature switch with contacts rated for 120 VAC, 5 amps, when shown on the PLANS. Switch settings to be at appropriate protection temperature.

14. Nameplate: Stainless steel securely attached to motor with stainless steel screws. All data to be permanently stamped into nameplate. Data to include:
    a. Horsepower.
    b. RPM.
    c. NEMA design.
    d. Phase.
    e. Hertz.
    f. Service factor.
    g. NEMA nominal efficiency.
    h. Power factor.
    i. Frame size.
    j. Duty.
    k. Class of insulation.
    l. Ambient temperature.
    m. Locked rotor KVA code.
    n. Full load amps.
    o. Locked rotor amps.
    p. Bearing identification by ABMA number.
    q. Model and catalog number.
    r. When power factor correction is provided in motor circuit, an auxiliary stainless steel nameplate to be securely attached to respective motor with stainless steel screws. Auxiliary nameplate to read "___ FLA with ____ KVAR power factor correction capacitor installed", with applicable values inserted as required. Sentence to be permanently stamped into auxiliary nameplate.
    s. Each motor is to have a stainless steel nameplate indicating essential lubrication information such as the type of lubricant, viscosity, frequency of lubrication, etc.
15. Additional Features for Motors Sized 200HP and Larger:
    a. Motor space heaters and temperature switch wired to a separate terminal box.
    b. Provide internal temperature switch with contacts rated for 120 VAC, 5 amp. Switch settings to be at appropriate protection temperature.
16. Additional Features for Motors with Power Factor Correction:
    a. High voltage terminal cabinet to be cast or fabricated steel of NEMA 4X construction, complete with hinged front doors with locking handle. Sized large enough to permit full stress cone terminations within the enclosure and to contain power correction capacitors, if required. Provide with ground lug and cable clamps for terminations. Motor leads into and out of cabinet to be sealed watertight.
    b. Low voltage terminal cabinet, of like construction to the high voltage cabinet, complete with terminal blocks. Each terminal block is to contain ten (10) spare terminal points.
    c. Capacitors to be provided when power factor correction is required. The capacitors to be installed in the high voltage terminal cabinet box. The terminal box to be sized large enough to house the capacitors.
17. Inverter Duty Motors:
    a. Variable speed drive motors are to be designed for pulse-width modulated inverter duty. Motor nameplate to note inverter duty classification.
    b. Motors to be used for inverter duty to meet requirements of NEMA MG 1, Section IV, Parts 30 and 31.
    c. Bearings to be electrically isolated to prevent stray current damage.
    d. Provide internal temperature switch with contacts rated for 120 VAC, 5 amp. Switch settings to be at appropriate protection temperature.
    e. Any limitations or caveats such as circuit length, cable type, or variable frequency drive characteristics are to be clearly identified in the submittal

and meet the requirements shown on the PLANS and specified elsewhere in other Specification Sections.

2.03 (NOT USED)

2.04 SOURCE QUALITY CONTROL

A. Factory Tests:
   1. Perform routine (production) tests on all motors in accordance with NEMA MG 1 and IEEE 112.
   2. For motors 100 HP and smaller, testing can be conducted on an identical motor.
   3. Testing:
      a. No load power at rated voltage.
      b. Locked rotor current.
      c. Efficiency at 50, 75 and 100 percent of rated horsepower in accordance with IEEE 112, Test Method B, and NEMA MG 1, Paragraphs 12.59 and 12.60.
      d. Power factor.
      e. Speed.
      f. Current at rated horsepower.
      g. kW input at rated horsepower.
   4. Motors larger than 100 HP are to be given a five point vibration test.

B. Test Report Forms:
   1. Routine Tests: IEEE 112, Form A-1.
   2. Efficiency and power factor by Test Method B, IEEE 112, Form A-2, and NEMA MG 1, Table 12-11.

PART 3 EXECUTION

3.01 - 3.02 (NOT USED)

3.03 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

A. Follow manufacturer's published instructions and alignment requirements for driven unit. Measure and record amperes at maximum load and verify proper overload heater selection.

3.04 - 3.10 (NOT USED)

3.11 MEASUREMENT AND PAYMENT

No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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SECTION 16141

MODIFICATIONS TO EXISTING 480 VOLT SWITCHBOARDS

PART 1 GENERAL

1.01 SCOPE

A. Furnish all labor, materials, equipment, and incidentals required to provide, and make ready for operation, the MODIFICATIONS required to the existing 480 Volt Switchboards located in the existing Inlet Facility, as specified herein and as also noted/shown on the PLANS. The existing 480 Volt Switchboards in the existing Inlet Facility are identified as IPS-SWBD-001 and IPS-SWBD-002 and are a product of Square D, manufactured in 2014.

B. The existing Switchboards are vital to the Waller Creek Inlet Facility process. Therefore, required interruptions to the facility process shall be minimized and carefully coordinated with the Owner.

1.02 RELATED WORK NOT INCLUDED

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the CONTRACTOR's responsibility for scheduling and coordinating the Work of subcontractors. Suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR's Work.

C. The PLANS designate the type, number, size and rating of devices included in the Switchboards.

D. Related work as called for on the PLANS, as specified herein or in other Sections of the Specifications.

1.03 QUALIFICATIONS

A. All parts and distribution and control equipment required to modify the existing Switchboards at the existing Inlet Facility shall be the product of the original manufacturer of the Switchboards, Square-D, and/or as recommended/approved by Square-D, NO EQUAL, for use in the existing Switchboards, and as also called for on the PLANS and in compliance with this Section of the Specifications. Substitute manufacturers will not be accepted.

B. Modifications to the Switchboards shall be performed and tested in accordance with the latest applicable requirements of NEMA, ANSI, UL, and NEC standards. Modifications to the Switchboards shall be performed by qualified, experienced, Square D factory trained technical (non-sales type) representative. Modifications performed by substitute representatives will not be accepted.

C. In addition to these Specifications, refer to the PLANS for specific requirements on the Switchboard.

1.04 SUBMITTALS

A. Submit shop drawings in accordance with the requirements of Section 01300 of the Contract Specifications. Include:
   1. Dimensioned/scaled top and bottom views, front elevations, and overhead bus duct connection
   2. One-line diagrams and wiring diagrams
   3. Catalog cut sheets. Include protective device coordination curves and current limiting circuit breaker/fuse peak current let through curves, where applicable.
   4. Key interlock scheme drawing and sequence of operations, where applicable.

B. Furnish Operation and Maintenance Manuals in accordance with the requirements of Section 01730 of the Contract Specifications. Include:
   1. Installation and operation manual.
   2. Renewal parts bulletin.
   3. As built drawings, including approved shop drawings.
   4. Test data.

1.05 DELIVERY STORAGE AND HANDLING

A. Deliver, store, protect, and handle products in conformance with manufacturer's recommended practices as outlined in applicable Installation and Maintenance Manuals.

B. Inspect and report concealed damage to carrier within their required time period.

C. At all times, store products in a clean and dry space. Maintain factory protection and/or provide an additional non-porous extra heavy duty plastic weatherproof housing. Cover to protect products from dirt, water, construction debris, and traffic.

D. Handle in accordance with NEMA and manufacturer’s written instructions. Lift only by lifting means provided for this express purpose. Handle carefully to avoid damage to product internal components, enclosure, and finish.

1.06 SPECIAL MANUFACTURER’S SERVICES

A. Furnish the services of a qualified, experienced, factory trained technical (non-sales type) representative to perform the modifications to the Switchboards. Include checking alignment of parts, wiring connections, operation of all parts (circuit breakers, relays, monitoring relays, etc.). Include time to correct and recheck any discrepancies which are discovered. Also include a report certifying that the equipment was installed properly tested and set in accordance with the Specifications and is in satisfactory operating condition. This certified report shall be provided to the Owner. Format and quantity of reports shall be per the requirements of Section 01300 of the Specifications.

B. Manufacturer's technical representative is to set, adjust and test all circuit breakers, relays, monitoring devices/units, etc. in the presence of a representative of the

Owner. A list of the protective device settings associated with the MAIN circuit breakers, as well as the largest load connected to the Switchboards will be furnished by the Owner. Additionally, the Owner will provide the Manufacturer with the characteristics of the protective devices that are most suitable for the system in providing proper protection and coordination. The selection will be based on the manufacturer's submittal of a variety of protective device curves for the Owner to select from. The settings will be based on coordination and short circuit studies performed by others. Provide the Owner with a test report certified by the manufacturer. Include a record of all settings in the test report. Format and quantity of reports shall be per the requirements of Section 01300 of the Specifications. The Manufacturer shall furnish the protective device of the appropriate characteristics selected by the Owner that shall be the most suitable for the proper protection and coordination of the system at No Additional Cost to the Owner.

C. Any problems encountered with the operation of equipment, parts, components, etc. installed within the Switchboards line-up shall be repaired/remedied by the manufacturer's technical representative.

PART 2 PRODUCTS

2.01 GENERAL

A. For additional construction notes and special requirements, refer to the PLANS.

2.02 CONSTRUCTION

A. Identification
   1. All component and control identification labels shall include the device name and number exactly as it appears on the PLANS. Refer to the PLANS.
   2. All control/metering wires shall be tagged and coded with an identification number. Tagging type and wire coding shall be per manufacturer's standard.
   3. All terminal blocks shall be identified.
   4. Properly label the control/metering devices mounted inside the each section using manufacturer's standard laminated labels installed in accordance with the manufacturer's standard method. Minimum text height shall be 3/16 inch.
   5. Nameplates:
      a. Type: 3-ply, 1/8" thick, rigid thermoset phenolic resin laminated cellulose paper base engraving stock per ASTM D-709, Type I. Nameplates shall be ASTM Grade ES-1, ES-2, or ES-3 as applicable for the face and lettering colors specified hereinafter. Flexible or acrylic tags will be not be accepted.
      b. Color: White-Black-White
      c. Lettering: Engraved through the face layer to the melamine middle layer. Nameplates located on the face of each section/compartment of each Switchboard shall be legible at a distance of six feet from the nameplate. Minimum text height shall be 3/16 inch.
      d. Accessories: Provide holes for mechanical fastening
      e. Attachment Means: Secured with two Stainless Steel screws/bolts per manufacturer's standard; use of adhesives shall not be accepted.

B. Compartment/component arrangement shall be as shown on the elevation PLANS.

2.03 FEEDER CIRCUIT BREAKERS

A. Provide thermal magnetic molded case circuit breakers with the following minimum requirements:
   1. U.L. listed minimum RMS symmetrical short circuit current rating equal to or greater than that of the main bus.
   2. Circuit breaker shall be three pole, 600 volt with a maximum continuous current carrying capacity shown on the PLANS.
   3. Breakers shall operate continuously when operating/running current is equal to 80% of the long time trip setting (or frame rating, as applicable) of the breakers.
   4. Breakers shall have an overcenter, toggle handle-operated, trip free mechanism with quick make, quick break action independent of the speed of the toggle handle operation. The design shall provide common tripping of all poles. Breakers shall be suitable for reverse feeding.
   5. Provide complete with rating plug and other accessories as required for proper operation of circuit breaker.
   6. Provide mechanical padlock attachment for each circuit breaker.
   7. Furnish lugs for feeders where required to facilitate field wiring termination, sizes shall be as required by the PLANS.

B. All branch circuiting circuit breakers shall be group mounted.

C. Provide where specifically shown on the PLANS:
   1. Current limiting circuit breaker
   2. Electronic trip attachment. Trip unit shall be solid state type with field adjustable long time, short time, ground fault and pick up settings.
   3. Auxiliary contacts rated for 120 volts A.C. Contacts shall satisfy the requirements of the PLANS.

PART 3 EXECUTION

3.01 FIELD INSTALLATION

A. Perform switchboard modifications in accordance with manufacturer's written guidelines, the NEC, and local codes.

B. Refinish all painted steel work that was damaged during Switchboard modification activities. Finish shall match the existing Switchboards.

3.02 FIELD TEST AND CHECKS

A. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding

B. The following minimum test and checks shall be made before energizing the Switchboards. These tests shall be performed by a Factory Trained Field Technician (non sales type).

1. Calibrate, adjust, set, and test all protective devices and metering units according to settings provided and required by subsection 1.06 “Special Manufacturers Services”.
2. Submit documentation of all tests outlined above. Include all test documentation data in operation and maintenance manuals.
3. Adjust all operating mechanisms for free mechanical movement per manufacturers Specifications.
4. Tighten bolted bus connections in accordance with manufacturer's instructions.

3.03 EQUIPMENT PROTECTION AND RESTORATION

A. Clean and vacuum clean all interior of the equipment.

B. Touch-up and restore damaged surfaces to factory finish.

C. After all connections have been made, the Contractor shall spray all terminals, terminal blocks, breakers with a moisture repelling chemical such as provided by CRC or Dow Chemical Corporation, or approved equal.

D. Notify the Engineer 24-hours prior to intent to spray the Switchboard. If no such notification is made it will be presumed that moisture proofing has not been accomplished.

3.04 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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SECTION 16150

RACEWAYS, FITTINGS AND SUPPORTS

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies raceways, fittings, and supports for all cables, conductors and electrical equipment. The Contractor shall furnish and install complete raceway systems in accordance with the following specifications and as also shown on the PLANS.

B. Refer to the conduit/wire schedule shown on the PLANS for a listing of proposed raceways and other requirements. The conduit/wire schedule shown on the PLANS is not inclusive of all equipment required by this Contract. Refer to Part 2 of this section for additional requirements.

1.02 RELATED REQUIREMENTS

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the CONTRACTOR's responsibility for scheduling and coordinating the Work of subcontractors. Suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR's Work.

C. Related work as called for on the PLANS, as specified herein or in other Sections of the Specifications.

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The Publications are references in the text by designation only.

B. This section contains references to codes and standards. They are a part of this section as specified. In case of conflict between the requirements of this section and the listed standards, the requirements of this section shall prevail. All raceways, fittings and supports are to be U.L. listed and certified and shall conform to ANSI and NEMA standards.

1.04 SUBMITTALS

A. The Contractor shall submit manufacturer's catalog data for all material provided under this section and in accordance with the requirements of Section 01300 and 01730 of the Specifications. The Contractor shall submit certified notification from the Manufacturer that the rigid aluminum conduit system and all related materials, as described within this specification, is 99.0 percent copper-free.

1. Submit certifications of training associated with proper installation the PVC coated rigid galvanized conduit and Fiberglass conduit.
2. Submit Material Safety Data sheets for all sealants, solvents, etc.

PART 2 PRODUCT

2.01 EXPOSED CONDUIT SYSTEM INDOOR, AND EXPOSED-OUTDOOR ABOVE GROUND LEVEL

A. General: All components shall be 99.0 percent copper free rigid aluminum.

B. Rigid Metal Conduit System
   1. Conduit run above ground shall be rigid aluminum in all areas unless specifically specified otherwise hereinafter in subsection 3.02, this Section of the Specifications.
   2. Rigid Aluminum Conduit shall meet the following requirements
      a. U.L. listed
      b. Comply with ANSI C80.5 and U.L.6.
   3. Bending Requirements: Furnish factory bends. 90-degree bends of conduit sizes equal to or greater than 4-inches in diameter shall have a minimum bending radius of 48-inches unless otherwise noted on the PLANS. 90-degree factory bends of conduit sizes less than 4-inches in diameter, shall be per manufacturers standard unless otherwise noted on the PLANS.
   4. Minimum conduit size for all work shall be 3/4 inches.
   5. Manufacturer: VAW of America Inc., or approved equal.

C. Conduit Hubs:
   1. Provide grounding type with integral threaded insulated throat, and with solderless grounding lugs, complete with rubber gasket.
   2. Manufacturer: by “Myers”, or approved equal.

D. Grounding Bushings:
   1. Provide with integral threaded insulated throat, and with solderless grounding lugs
   2. Manufacturer: “O.Z. Gedney” type ABLG with specified options, or approved equal.

E. Conduit Bodies
   1. Conduit body covers shall be of the bolt-on type and shall have Type 316-Stainless Steel screws/hardware.
   2. Manufacturer: **“**Crouse-Hinds” Form-7, or approved equal..

F. Conduit Unions: Threaded, as manufactured by “Crouse-Hinds” type UNF or UNY, or approved equal

G. Conduit Reducers:
   1. Threaded.
   2. Shall be used for final conduit system connection to equipment where shown on the PLANS
   3. Manufacturer: “Crouse-Hinds” type RE and type REA, or approved equal.

H. Cord and Cable Fittings:
   1. Provide threaded gland nut, straight threaded body, and also a neoprene sealing cable bushing.
   2. Furnished with a Type 316 Stainless Steel wire mesh grip
   3. Shall be used only where specifically shown on the PLANS.
   4. Manufacturer: "Crouse-Hinds" type CGB, complete with all specified accessories, or approved equal.

I. Expansion Fittings:
   1. Furnished with oversized sleeve and insulated bushing
   2. Furnished with tinned copper braided bonding jumper
   3. Manufacturer: O.Z./Gedney Type EXPB-A, or approved equal

J. Sealing Fittings:
   1. Furnish with drain
   2. Manufacturer: Crouse Hinds, Type EYD, or approved equal
   3. Sealing Compound:
      a. Where conduit seals are installed in compliance with NEC Class-I and Class-II requirements, the sealing compound shall be as manufactured by "Crouse-Hinds" type Chico-AP, or approved equal.
      b. Where conduit seals are not required for NEC Class-I and Class-II installations but are shown to be installed on the PLANS to block the migration of corrosive gases into the conduit system and conduit bodies, the conduit seals Sealing Compound shall be Scotchcast Reenterable Electrical Insulating Resin 2123 as manufactured by "3M", or approved equal.
      c. Coordinate application with the Owner.
      d. For vertical seals use mineral wool packing material to form a dam in the annular space around the conductors and hold the sealing compound in place while it cures. Packing material shall be as manufactured by "Crouse-Hinds" type Chico-X, or approved equal.

K. Miscellaneous Requirements:
   1. Conduit nipples shall have two independent sets of threads.

2.02 UNDERGROUND CONDUIT IN DUCT BANK SYSTEM

A. General:
   1. Type: All components shall be non-metallic, except where noted herein and specifically shown otherwise on the PLANS. Refer to the PLANS.
   2. Bending Requirements: Furnish factory bends. 90-degree factory bends of conduit sizes equal to or greater than 4-inches in diameter shall have a minimum bending radius of 48-inches. Also, all 90-degree, 45-degree, and 30-degree conduit bends shall be factory made bends.
   3. Minimum conduit size for all work shall be 1 inch.

B. Rigid Nonmetallic Conduit System
   1. All components shall be schedule 40 PVC, heavy wall, U.L. rated, No. 651, conforming to NEMA standard TC-2-75 and listed in conformity with Article 352 of the latest edition of the National Electrical Code (NEC).
   2. Solvent weld: Shall be a type approved by the conduit manufacturer.

3. Manufacturer: Conduit shall be as manufactured by “Prime Conduit”, or approved equal.

C. PVC Coated Rigid Galvanized Steel Conduit System
   1. Material: Steel per UL 6 and ANSI C80.1, hot-dipped galvanized inside and out after the threads are cut.
   2. Exterior Coatings:
      a. After galvanizing, the conduit/fittings shall be uniformly and consistently coated with a gray PVC coating of minimal 40 mil thickness. Exception: The threads shall be coated with urethane in lieu of PVC.
      b. The PVC coating adhesion performance shall be ETL verified to the Intertek ETL SEMKO, High Temperature H_2O PVC Coating Adhesion, Test Procedure for 200 hours.
   3. Interior Coating:
      a. After galvanizing, the interior of conduit and fittings shall be uniformly and consistently coated with a urethane coating of nominal 2 mil thickness.
   4. Accessories: Threads shall be furnished with plastic thread protector caps.
   5. Manufacturer: Robroy Industries, Perma-Cote, or Plasti-Bond REDH_2OT.

D. Reinforced Thermosetting Resin Conduit (RTRC) Conduit System
   1. General:
      a. May be used only where specifically permitted by subsection 3.02.C.8, this Section of the Specifications.
      b. Shall comply with NEC Article 355.
   2. Material:
      a. Fiberglass, Reinforced Thermosetting Resin Conduit. Resin system shall be epoxy based, with no fillers, using an anhydride curing agent. The fiberglass shall consist of continuous E-glass Grade “A” roving. Conduit shall be low-halogen per UL 2515.
      b. Manufactured using the single circuit filament winding process. Oven cured. Nominal winding angle of 54.75 degrees.
      c. Carbon black shall be used as ultra violet inhibitor.
      d. Internal walls shall be smooth with all fibers embedded in epoxy.
   3. Certifications: NEMA TC14, UL 2420 and 2515.
   4. Suitable for installation exposed outdoors and encased in concrete
   5. Fittings:
      a. The following fittings shall be provided. Example part numbers shown hereinafter apply to the raceway system manufacturer specified hereinafter. All part numbers required for this project are not shown. Contractor to coordinate necessary part numbers with the manufacturer for a complete installation.
      b. 90 degree bends with factory installed 2 deep socket PVC coupling and 1 fiberglass coupling bonded to elbow:
         1) For conduit sized 1” – 1 ½”, provide type IPS. Example part number for 1”: 10C-XW-90-2DF
         2) For conduit sized 2” – 6”, use type ID. Example part number for 2”: 20D-XW-90-2DF
      c. Sleeve couplings:
         1) For conduit sized 1” – 1 ½”, use type IPS. Example part number for 1”: 10C-XW-42

2) For conduit sized 2” – 6”, use type ID. Example part number for 2”: 20D-XW-42

d. Female Terminal Adapters:
1) For conduit sized 1” – 1 ½”, use type IPS. Example part number for 1”: 10C-XW-32
2) For conduit sized 2” – 6”, use type ID. Example part number for 2”: 20D-XW-32

e. Straight Socket Conduit:
1) For conduit sized 1” – 1 ½”, use type IPS. Example part number for 1”: 10C-XW-10S
2) For conduit sized 2” – 6”, use type ID. Example part number for 2”: 20D-XW-20-S

6. Mix Epoxy Adhesive:
a. For ambient temperatures 40 - 70 degree F, provide type CM-2040-SFG
b. For ambient temperatures 70 degree F and above, provide type CM-2070-SFG.

7. Mix Epoxy Adhesive Mixing Tip and Gun:
a. Mixing Tip: CM-MT
b. Mixing Gun: CM-AG

8. Accessories: Provide with adhesive couplings, spigots, adapters, and other adhesive fittings as required to connect to the other specified raceways as shown on the PLANS.

9. Manufacturer: Champion Fiberglass “Haz Duct XW”, no equal.

2.03 LIQUID TIGHT FLEXIBLE CONDUIT

A. Sizes: - Greater than or equal to ¾ inch and smaller than or equal to 2 inch Flexible Conduit:
1. Conduit Type: Non-metallic type liquid tight conduit, formed from PVC plastic
2. Conduit Installation Temperature Range: –20 degrees Celsius to + 60 degrees Celsius (suitable for use outdoors and indoors)
3. Conduit Manufacturer: ELECTRI-FLEX series NM type B-PVC, or approved equal.
4. Fittings Type: Non-metallic PVC fittings
5. Fittings Manufacturer: CARFLEX, or approved equal.

B. Sizes:- Greater than 2 inch Flexible Conduit:
1. Conduit Type: PVC-COATED metallic liquid tight conduit, formed from PVC plastic
2. Conduit Temperature Range: –20 degrees Celsius to + 60 degrees Celsius (suitable for use outdoors and indoors)
3. Conduit Manufacturer: SEALTITE, or approved equal.
4. Fittings Type: 99.0 percent Copper-Free-Aluminum
5. Fittings Manufacturer: Appleton, Crouse-Hinds, or approved equal.

C. Minimum liquid-tight flexible conduit size for all work shall be ¾-inch unless specifically noted otherwise on the PLANS. Exception: ½” non-metallic conduit may be used for the final conduit connection to device with ½” threaded opening with prior Owner approval.

2.04 MISCELLANEOUS

A. Polyurethane foam duct sealant: FST-250 and FST-MINI Duct Sealant as manufactured by “Polywater”, or approved equal

B. Pipe Tape: 20 mil, 3M company No.51, or approved equal

C. Conduit Sleeves
   1. Conduit sleeves shall be schedule 80 PVC, heavy wall, U.L. rated, No. 651, conforming to NEMA standard TC-2-75 and listed in conformity with Article 352 of the National Electrical Code (NEC).

D. Conduit Hole Seals
   1. Hole seals shall be stainless steel, U.L. listed as NEMA 4X oil-tight, complete with oil-resistant gasketing, backplate, stud and wing nut. Hole seals shall be manufactured by Hoffman, Rittal, Cooper B-Line, or approved equal.

E. Armored Cable Termination Fittings:
   1. Materials: 99.0 percent copper free aluminum body, gland nut, and armor stop bushing. Stainless Steel grounding/retaining spring. Neoprene bushing.
   2. Manufacturer: Crouse-Hinds “Terminator” TMC Cable Fittings, or approved equal.

F. Exposed Conduit Identification
   1. Identify/Tag all exposed above ground conduits, at source (origin), and at destination, and all conduits routed between devices/cabinets/junction boxes/lights/receptacles/etc. Also, tag conduits stubbed up in free-standing cabinets, such as switchboards, control panels, individual equipment control panels, pull boxes, junction boxes, electrical closets, etc.
      a. Type: Aluminum, 16 gauge minimum thickness
      b. Lettering: 1/4 inch height, minimum, engraved/stamped into the aluminum tag.
      c. Format: Tag shall identify conduits’ origin and destination with destination shown within parentheses [e.g. IPS-SWBD-002(IPS-CP-MS1)].
         1) Submit for approval a complete schedule of all conduit identification tags
      d. Accessories: Provide holes for mechanical fastening.
      e. Attachment Means: Securely hang nameplates from each sensor/control/instrument device by a flexible stainless steel snap-on type hanger/key-chain cord (neatly drill a hole through the top of the identification nameplate for this purpose).

2.05 ELECTRICAL EQUIPMENT AND RACEWAY SYSTEM SUPPORT CHANNELS

A. General requirements for all support channels:
   1. Channels located in all areas:
      a. Type: Type 316-Stainless Steel
      b. Manufacturer: “Unistrut Corporation” series P-1000ST and P-1001ST, or approved equal.

B. All fastening hardware, fittings, supports, post bases, conduit clamps, beam clamps channel nuts, threaded rod, framing system, etc. shall be as follows:
   1. Items located in all areas:
      a. Type 316 stainless steel
   2. Manufacturer: “Unistrut Corporation”, or approved equal.
   3. Additionally, the following designations correspond to the following “Unistrut Corporation” series numbers as used in the details shown on the PLANS:
      a. Items located in all areas:
         1) Beam clamps: “Unistrut Corporation” series P-2785ST and P-2786ST, or approved equal.
         2) Swivel fittings: “Unistrut Corporation” series M-2137ST, or approved equal.
         3) Post bases: “Unistrut Corporation” series P-2072AST and series P-2073AST, or approved equal.
         4) Hanger clevis fittings: “Unistrut Corporation” series P-2682ST, or approved equal.

C. Expansion anchors shall be installed per the manufacturer’s recommendations and shall be as follows:
   1. Anchors located in all areas:
      a. Type 316-Stainless Steel. Anchors shall also be per Section 05051 “Anchorages”.
   2. Also refer to the PLANS.

2.06 MANHOLES AND HANDHOLES

A. General requirements for Handholes:
   1. Vault shall consist of a 3” high base, 12’ high body and 12” high extension, all constructed of precast reinforced concrete.
   2. Cover shall be a bolt-down, traffic rated type constructed of galvanized steel and marked with the word ELECTRIC.
   3. Handhole shall be a 17” x 30” Traffic Pull Box Model 6-T PB manufactured by Brooks, or approved equal.

B. Refer to the PLANS and Specifications for manhole requirements.

C. Provide all cable pulling eyes, cable support system components and accessories indicated on the PLANS and as otherwise required. Arrange support systems so that each cable can be securely anchored.

D. The manhole structural wall opposite each duct bank penetration into the manhole shall be equipped with a cable pulling eye (one cable pulling eye per each duct bank penetration into the manhole). Position each pulling eye with coordinates (vertical elevation and horizontal alignment) to accommodate cable pulling and minimize cable pulling tension. Pulling eyes shall be bonded to the manhole wall structural reinforcement prior to pouring concrete. Pulling eyes may not be shown on the manhole vault structural PLANS, however, they are to be installed per the requirements of this specification.

2.07 CABLE SUPPORT SYSTEM IN UNDERGROUND ELECTRICAL MANHOLES AND HANDHOLES

A. General Requirements for support channels:
   1. Type: Type 316-Stainless Steel
   2. Manufacturer: "Unistrut Corporation" series P-1000ST and P-1001ST, or approved equal.

B. All fastening hardware, fittings, supports, post bases, conduit clamps, beam clamps channel nuts, threaded rod, framing system, etc. shall be fabricated with Type 316 stainless steel, as manufactured by "Unistrut Corporation", or approved equal. Additionally, the following designations correspond to the following "Unistrut Corporation" series numbers as used in the details shown on the PLANS:
   1. Porcelain Clamps and Saddles-"Unistrut Corporation P1787A through P1795B Porcelain Cable Clamps", for both Electric and Communications and Instrumentation and Control.
   2. Surface Mounted Vertical Channels (Columns)-"Unistrut P-1000ST Type 316 stainless steel channels and accompanying Unistrut post bases".
   3. Surface Mounted Horizontal Channels (side mounted channels)-**"**Unistrut P-1001ST Type 316 stainless steel channels and accompanying Unistrut post bases as well as wall mounted vertical channels".
   4. Brackets-**"**Unistrut" P-2515 ST of 15 inch length for Electric, and P-2542 ST of 15 inch length for Telephone and Communications. All parts given shall be Type 316 stainless steel.
   5. Beam Clamps – "Unistrut" P-2785 ST". All parts given shall be Type 316 stainless steel.

PART 3 EXECUTION

3.01 GENERAL

A. Install electrical equipment and conduit raceway system in accordance with the recommendations of the manufacturer, the requirements of the latest edition of the National Electrical Code, and the PLANS. All cables/wiring shall be installed in a raceway system.

B. Contractor shall be trained and certified by the PVC coated rigid galvanized steel conduit manufacturer in the proper installation of the PVC coated rigid galvanized conduit.

C. Contractor shall be trained and certified by the Fiberglass conduit manufacturer in the proper installation of the Fiberglass conduit.

3.02 CONDUIT SYSTEM

A. General:
   1. Run conduits continuous from outlet to outlet, from outlets to cabinets, pull or junction boxes, etc.

2. Install all conduits as a complete system before wiring is pulled in. Conduits shall be reamed, thoroughly cleaned of debris, and swabbed immediately before wire is pulled.
3. Furnish and install expansion fitting for each conduit across structural expansion joints. Coordinate locations of expansion joints with the PLANS. Additionally, furnish and install additional appropriate fittings such as conduit unions, adapters, etc. as required for a complete installation.
4. Conduit shall contain no more than the equivalent of three (3) 90-degree bends between outlets or pull points.
5. Maintain a minimum 6-inch clearance between conduit and piping and a minimum 12-inch clearance between conduit and heat sources.
6. Protect all coated conduit from accidental coating damage during storage and installation. Repair all damaged conduits in accordance with manufacturer's recommendations at no additional cost to the OWNER.
7. Furnish and install temporary conduit closures during construction activities to prevent foreign matter from entering raceways.
8. Furnish and install conduit measuring tape in each empty spare conduit as manufactured by Ideal Industries Incorporated or approved equal.

B. Exposed Conduit System Indoor, and Exposed-Outdoor Above Ground Level:
1. Rigid conduit joints shall be cut square, threaded, reamed smooth and drawn up tight. Make field bends or offsets with an approved bender or hickey or hub type conduit fittings.
2. Run conduit parallel or at right angles to building lines and such to avoid moisture traps.
3. Arrange conduits to maintain headroom and present a neat appearance.
4. Support conduit using support channels as shown on the PLANS and as specified herein.
5. Coat all conduit threads with Penetrox or Noalox prior to assembly.
6. Secure conduit runs firmly to specified support channels by conduit straps or by hangers, as required, and as shown on the PLANS.

C. Underground Conduit in Duct Bank System
1. Install all underground conduit in concrete encased and steel reinforced duct banks.
2. Concrete shall be Class 'A' per Section 403S "Concrete for Structures". A red admixture shall be added to the concrete a rate of 12 pounds per cubic yard of concrete and per the requirements of Section 403S. Red admixture shall meet the requirements of ASTM C-979-82. Red admixture shall be as manufactured by ChemSystems, Inc. series HBS #120 Conduit Red, or approved equal. Also, refer to conduit/duct bank reinforcement and concrete encasement details shown on the PLANS.
3. Reinforcing Steel shall be per Section 406S "Reinforcing Steel" unless noted otherwise on the PLANS. Also, refer to conduit/duct bank reinforcement and concrete encasement details shown on the PLANS.
4. Install detectable underground warning tapes at 12-inches below finished grade along the entire length of each duct bank. Each tape shall be a minimum of 6-inches wide, 4 mil thick, laminated, and contain a aluminum foil core backing. The tape shall be detectable using a non-ferrous locator. The tape color shall be red and shall be labeled with the words "CAUTION BURIED ELECTRIC LINE BELOW" in black lettering. For duct banks less than 24-

inches wide, install one length of tape aligned along the centerline of the duct bank. For duct banks 24-inches wide and larger, install two lengths of tape, with each length aligned with each edge of the duct bank along the width of the duct bank. Warning tape is not required along the length of the specific portion of a duct bank that is installed underneath a building concrete floor slab.

5. Provide a minimum of 3-inches separation between conduits installed in concrete construction except at panelboards, pull or junction boxes and/or other locations where the conduits are grouped. Furnish and install plastic spacers as shown on the PLANS.
6. Underground system conduits shall be installed with a minimum depth below finished grade of 24" to top of concrete envelope of duct bank and shall slope 3-inches per 100 feet from high points toward pull boxes and handholes/manholes, at minimum. Increase the minimum duct bank depths below finished grade as shown on the PLANS. Additionally, underground duct bank system shall be routed per the PLANS and coordinated with the depths of Civil/Structural foundations, beams, etc. No conduit shall be routed through grade beam slab of a building floor slab.
7. All underground conduit joints shall be watertight in accordance with the manufacturer's recommendations.
8. Transition from underground (underground work in duct bank) to above ground conduit as shown on the PLANS.
9. Where a duct bank penetrates a concrete structure, dowel between the duct bank and the structure at the point of penetration and tie the steel reinforcing rebar system of the underground duct bank system to the concrete structure and steel reinforcing rebar system of the concrete structure. Refer to the Civil/Structural Specifications and PLANS for additional requirements.
10. Where PVC coated rigid galvanized steel conduit is shown on the PLANS, Contractor may employ RTRC conduit in lieu of the PVC coated rigid galvanized steel conduit.
11. Where factory bends/elbows (11-1/4°, 22-1/2°, 30°, 45°, and 90°), as specified in Part 2.02 A 2 of this Specification, are not manufactured and field bends become necessary, field bends may be performed using a heat box type electric PVC conduit heater. The use of open flame to heat the PVC conduit is NOT permitted. Utilize a PVC conduit plug set to plug the ends of the conduit throughout the heating process and trap the air inside the conduit to help keep the PVC conduit from collapsing while forming the bend.

D. Conduit Penetrations:
   1. Install sleeves for conduit penetrations of walls and floors unless shown otherwise on the PLANS. Install sleeves during erection of concrete and masonry walls. Exception: Sleeves are not required for conduits stub-ups through floor slab from underground duct bank.
   2. Where aluminum conduit penetrates a wall/floor-slab and/or walls/floors of dissimilar material (other than Stainless Steel) or is in contact with dissimilar material, wrap the aluminum conduit with Pipe Tape using a 50 percent overlap throughout the entire distance/length of the penetration and an additional 6-inches of distance beyond either side of the penetration/contacted region.
   3. Install pitch pans on conduits which penetrate through roofs.

4. Also refer to the conduit penetration details shown on the PLANS.

E. Miscellaneous:
   1. Seal empty spare conduits (at above ground stub-ups) with an aluminum screw in plug sized to the trade size of the conduits.
      a. Threaded insert plug shall have a square head and shall be constructed from copper-free Aluminum material.
      b. Threaded insert plug shall be Type CUPX by Hubbell-Killark, Type PLG by Crouse-Hinds, or approved equal.
   2. Seal and pack/fill ends of each conduit with polyurethane foam duct sealant.
   3. In all sealing fittings, utilize sealing compound to seal around and between each conductor and associated sealing fitting body.

F. Requirements for cables inside of Manholes, Handholes, etc.:
   1. Arrange cables so that there is a minimum of crossing. Provide slack in each cable.
   2. Secure cables in handholes/manholes on support channel system as specified herein and as shown on the PLANS.

G. Connections to Equipment:
   1. Liquid tight flexible conduit shall be used for connections to motors, field instruments, etc., and any equipment subject to vibration, and where shown on the PLANS. Length of conduit shall not exceed 36-inches, unless specifically noted otherwise on the PLANS or approved by the Owner.

3.03 INSTALLATION OF SUPPORT CHANNELS

A. Utilize support channels and mounting hardware as previously specified to install raceways, and any other surface mounted electrical, instrumentation and control equipment. Refer to details shown on the PLANS. Use 316 stainless steel split ring lock washers with mounting hardware when installing support channels.

B. Whenever support channels are cut in the field, the cut ends shall be filed smooth and shall be cleaned using liberal amounts of a contact cleaner to remove all residual elements from the cutting and filing process. Coat all field cut ends with cold galvanizing paint.

3.04 INSTALLATION OF HANDHOLES

A. Handhole shall be installed where shown on the PLANS.

B. Handhole shall be set so that the top of the handhole and its associated cover are flush with the finished concrete surface in which the handhole is placed.

C. Coordinate handhole installation with Civil/Structural. At minimum, install the handhole in accordance with the handhole manufacturer's recommended installation procedure.

3.05 HOUSEKEEPING CONCRETE PAD FOR EQUIPMENT

A. Provide housekeeping concrete pad for all outdoor equipment whether it is free-standing or surface mounted. All housekeeping pad edges shall be chamfered. Outdoor electrical equipment pads shall be as detailed on the PLANS.

B. Provide housekeeping concrete pad for indoor all free-standing equipment. Indoor electrical equipment pads shall be as detailed on the PLANS.

3.06 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

SECTION 16200

WIRING (600 VOLTS AND BELOW)

PART 1 GENERAL

1.01 SUMMARY

A. Furnish and install the field wiring as specified herein and as shown on the PLANS.

B. Furnish and install all wiring required to make the electrical system completely and satisfactorily operable. Comply with the National Electrical Code and all applicable federal, state, and local codes, regulations and ordinances.

C. The requirements of this section also apply in whole to the installation of the fiber-optic cables and Ethernet copper cables. Fiber optic cables are specified in Section 17600 “Distributed Control System” of the Specifications.

1.02 RELATED REQUIREMENTS

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the CONTRACTOR’s responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR’s Work.

C. The PLANS designate the type, number, and size of field wiring.

D. Related work as called for on the PLANS, as specified herein or in other Sections of the Specifications.

1.03 SUBMITTALS

A. Submit shop drawings in accordance with Section 01300 of the Contract Specifications.

B. Submit Operations and Maintenance Manuals (O&M) in accordance with Section 01730 of the Contract Specifications. O&M Manuals shall include copies of the approved shop drawings, factory and on-site/field test data.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. All wire and cable on this project shall be new, unused, in good condition and shall be delivered in standard coils, packages or reels. Submit wire samples when requested by the OWNER. Final acceptance of wire shall be made by the OWNER or its representative.

2.02 SINGLE CONDUCTOR - GENERAL ELECTRICAL POWER SYSTEM AND AUXILIARY ELECTRICAL SYSTEM WIRING

A. All wire shall be 98% conductivity copper, stranded, single conductor Type XHHW-2. This wire shall have moisture resistant insulation and clean stripping characteristics. Wire shall be marked at minimum distance of every ten feet (10') with the size, type and voltage of the wires as well as the manufacturer's name and measurement markers. All neutral and ground wires shall be insulated and identified and marked.

B. The pigmentation of the wire insulation shall conform to the color table listed below:

Phase	277/480 Volts	120/208 Volts AC	24 Volts DC
ΦA	Brown	Red	----------
ΦB	Yellow	Black	----------
ΦC	Purple	Blue	----------
Neutral	Gray	White	----------
Ground	Green	Green	Green
Motor Space Heater (H)	----------	Black	----------
DC (+)	----------	----------	Blue
DC (-)	----------	----------	Brown

C. Any interlock wiring installed in one device with power from another device shall be properly marked.

D. The minimum wire size shall be No.10 for all wiring unless shown otherwise on the PLANS.

E. Departures from the sizes shown shall be made only in those cases in which the National Electric Code requires the use of larger conductors.

F. General Electrical Power System and Auxiliary Electrical System Wiring shall be as manufactured by General Cable Company, The Okonite Company, or approved equal.

2.03 SIGNAL AND COMMUNICATION WIRING

A. 4-20 Milliamp Signal wiring:
   1. Number of Pairs: One
   2. Wire Size: #16 AWG
   3. Type of Conductors: Stranded copper conductors, twisted
   4. Individual Conductor Insulation: PVC
   5. Individual Conductor Insulation Color: Positive (+) is Black, Negative (-) is White.
   6. Drain Wire: Tinned copper
   7. Overall Shield: Aluminum-mylar shield.
   8. Overall Jacket: PVC
   9. Overall Jacket Color: Black.

10. Manufacturer: Samuel Moore and Company, Dekoron Division, Cat. No. 1852 or approved equal.

2.04 SINGLE CONDUCTOR CONTROL WIRING

A. Single conductor control wiring shall be 98% conductivity copper, stranded, single conductor Type XHHW-2. This wire shall have moisture resistant insulation and clean stripping characteristics. Wire shall be marked at minimum distance of every ten feet (10') with the size, type and voltage of the wires as well as the manufacturer's name and measurement markers.

B. Conductors shall have a minimum size of #14 AWG, unless shown otherwise on the PLANS. The color of the wire shall be RED.

C. Single Conductor Control Wiring shall be as manufactured by General Cable Company, The Okonite Company**,** or approved equal.

2.05 GENERAL ELECTRICAL POWER SYSTEM AND AUXILIARY ELECTRICAL SYSTEM ARMORED CABLE

A. General: Multi-Conductor power system and auxiliary electrical system armored cables shall be rated 600 volts. Cables shall be suitable and rated for installation in wet or dry locations, for AC or DC service at conductor temperatures of 90 degrees C. Cable shall be suitable and rated for open runs of cable, installation in conduit system, cable trough system, cable tray system, and directly buried in the ground/earth.

B. Features: As minimum, the Multi-Conductor armored power cables shall have the following features:
   1. UL Listed as type MC-HL cable as well as Marine Shipboard Cable
   2. Passes the IEEE 383 and IEEE 1202 vertical tray flame tests.

C. Conductors: Each individual conductor in each multi-conductor cable (inclusive of grounding conductor) shall be copper per ASTM B-3. Each conductor shall have the following additional features:
   1. Stranding:
      a. Conductor Sizes Smaller than No. 8 AWG: Stranded per ASTM B-8
      b. Conductor Sizes Equal To and Larger than No. 8 AWG: Stranded per ASTM B-496.
   2. Insulation: Cross linked polyethylene insulation listed to UL Type XHHW-2
   3. Conductor Identification: Each conductor shall be uniquely identified per the manufacturer’s standard method. Color coded insulation per 2.02.B, this Section of the Specifications, is preferred.
   4. Size of each conductor shall be as shown on the Conduit/Wire Schedule shown in the PLANS.

D. Overall Armor Sheath: Close fitting, impervious, welded, corrugated aluminum C-L-X per UL 1569.

E. Overall Outer Jacket: Each multi-conductor cable shall be covered with overall black PVC jacket. Minimum jacket thickness is 50 mils.

F. Number of conductors in a cable: Number of conductors shall be as shown on the Conduit/Wire Schedule shown in the PLANS. Note: The cable armor shall not be considered as the equipment grounding conductor.

G. Manufacturer: Okonite-C-L-X Type MC-HL (XHHW-2), or approved equal.

2.06 MULTI-CONDUCTOR CONTROL SHIELDED CABLE

A. General: Multi-Conductor control system shielded cables shall be rated 600 volts. Cables shall be suitable and rated for installation for AC or DC service in wet or dry locations at conductor temperatures of 90 degrees C. Cable shall be suitable and rated for open runs of cable, installation in conduit system, cable trough system, cable tray system, and directly buried in the ground/earth.

B. Features: As minimum, the Multi-Conductor shielded control cables shall have the following features:
   1. Passes the IEEE 383 and IEEE 1202 vertical tray flame tests.

C. Conductors: Each individual conductor in each multi-conductor cable shall be copper per ASTM B-3. Each conductor shall have the following additional features:
   1. Stranding: Class B stranding per ASTM B-8
   2. Insulation: Heat moisture, flame and chemically resistant ethylene-propylene compound. Minimum insulation thickness is 30 mils.
   3. Conductor Identification: Color coded using base colors and tracers according to the following:

Conductor Size	Number of Conductors in a cable	Conductor Insulation Thickness	Color Code Cond. No.	Color Code Base Color	Color Code Tracer(s)
#12 AWG	Nineteen (19)	30 mils	1	Black	----
			2	White	----
			3	Red	----
			4	Green	----
			5	Orange	----
			6	Blue	----
			7	White	Black
			8	Red	Black
			9	Green	Black
			10	Orange	Black
			11	Blue	Black
			12	Black	White
			13	Red	White
			14	Green	White
			15	Blue	White
			16	Black	Red
			17	White	Red
			18	Orange	Red
			19	Blue	Red
			1	Black	----
			2	White	----
			3	Red	----
			4	Green	----

Conductor Size	Number of Conductors in a cable	Conductor Insulation Thickness	Cond. No.	Color Code Base Color	Color Code Tracer(s)
			5	Orange	----
			6	Blue	----
			7	White	Black
			8	Red	Black
			9	Green	Black
			10	Orange	Black
			11	Blue	Black
			12	Black	White
			13	Red	White
			14	Green	White
			15	Blue	White
			16	Black	Red
#12 AWG	Thirty Seven (37)	30 mils	17	White	Red
			18	Orange	Red
			19	Blue	Red
			20	Red	Green
			21	Orange	Green
			22	Black	White & Red
			23	White	Black & Red
			24	Red	Black & White
			25	Green	Black & White
			26	Orange	Black & White
			27	Blue	Black & White
			28	Black	Red & Green
			29	White	Red & Green
			30	Red	Black & Green
			31	Green	Black & Orange
			32	Orange	Black & Green
			33	Blue	White & Orange
			34	Black	White & Orange
			35	White	Red & Orange
			36	Orange	White & Blue
			37	White	Red & Blue

D. Size of each conductor and quantity of conductors: There shall be two kinds of multi-conductor control cables: Nineteen (19) conductor (#12 AWG) cables, and Thirty Seven (37) conductor (#12 AWG) cables. Sizes and quantities shall be as shown on the Conduit/Wire Schedule shown in the PLANS.

E. Shield: 5 mil longitudinal corrugated copper tape.

F. Overall outer jacket: Each multi-conductor cable shall be covered with overall thermoset chlorinated polyethylene compound outer jacket resistant to moisture, ozone, oil and most chemicals. Minimum jacket thickness is 80 mils.

G. Number of conductors in a cable: Number of conductors shall be as shown on the Conduit/Wire Schedule shown in the PLANS. Note: The cable shield shall not be considered as the equipment grounding conductor.

H. Manufacturer: Okonite FMR-LCS Okolon TS-CPE, or approved equal.

2.07 WIRE TAGGING

A. Wire Tags:
   1. Rating: Flame-Retardant,
   2. Style: Heavy-Duty Industrial Grade
   3. Type: Heat Shrinkable type.
   4. Character Height: 1/8 inch.
   5. Maximum Length: 2 inches.
   6. Text Type: Typed with indelible marking process. Handwritten shall not be accepted.
   7. Color: White.
      a. Exception: Use Yellow for instrumentation/control circuits as described in Section 17200.
   8. Manufacturer: “Raychem type Heavy-Duty Industrial Grade ShrinkMark Heat-Shrinkable Marking Sleeves”, or approved equal. Utilize "Raychem" Portable-Marking-System” complete with wire tag cartridges, or approved equal.

2.08 MISCELLANEOUS

A. Wire Pulling Lubricant: Ideal ClearGlide, or approved equal

B. Multi-Cable Connector Blocks:
   1. Use only for power wiring termination for motors rated 600V and below
   2. 600V rated
   3. Insulated with UV rated chemical resistant plastisol compound that will not support combustion
   4. Suitable for use with fine stranded extra-flexible wiring
   5. Suitable for use with aluminum and copper conductors
   6. U. L. 486A Listed
   7. Pre-filled with an oxide inhibitor.
   8. Manufacturer: “Polaris Connectors” Series Polaris Grey, or approved equal.

C. Submersible Splice Connectors
   1. Use only where indicated on the PLANS for submersible applications of 600V and below power and control wiring terminations.
   2. 600V rated
   3. Manufactured from high strength 6061-T6 aluminum alloy
   4. Encapsulated in rubber with a nominal thickness of 125 mils. And high dielectric strength.
   5. Suitable for use with aluminum and copper conductors
   6. U.L. 486D Listed
   7. Manufacturer: “Polaris Connectors” Series ISPBS Submersible Splice Connectors and Series ISPB2/0 and ISPBO2/0 Submersible Streetlight Connectors, or approved equal.

D. Corrosion Resistant and Moisture Repelling Electrical Coating/Spray:
   1. Color: Clear. Coordinate spray color with the Owner. Furnish and install the color requested by the Owner at No Additional Cost to the Owner.
   2. Type: Corrosion resistant and moisture repellant fast drying spray coating sealant

3. Manufacturer: "3M" 1601 Clear-Color Fast Drying Sealer and Insulator, or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Before wire is pulled into any conduit, thoroughly swab the conduit to remove all foreign material and to permit the wire to be pulled into a clean, dry conduit. Use wire pulling lubricant in pulling any wire. Pull all conductors into their respective conduits by hand except where written permission of the OWNER is secured to the contrary.

B. No wire splices shall be accepted except as permitted below:
   1. SPLICING OF 208/120 VOLT LIGHTING AND RECEPTACLE CIRCUITING:
      a. General: Perform all splicing in splice/junction boxes dedicated for this purpose.
      b. For splices where wiring is:
         1) #10 AWG and smaller: Utilize 600 volts WeatherProof Wire-Nut Wire Connectors. The WeatherProof Wire-Nut Wire Connectors shall be twist-on type and shall be pre-filled (factory- filled) with Silicone-Based Sealant for maximum protection against Moisture and Corrosion. The WeatherProof Wire-Nut Wire Connectors shall be as manufactured by IDEAL Model 61, 62, or 63 WeatherProof Wire-Nut Wire Connectors, or approved equal.
         2) All other sizes: Use the Multi-Cable Connector Blocks as Specified in 2.08.C, this Section of the Specifications.

C. For wiring termination to motors rated 600 volt and below, use the Multi-Cable Connector Blocks as Specified in 2.08.C, this Section of the Specifications.

D. All wiring connections must be insulated with 600 volt insulation system

E. Tagging:
   1. Tag all power, Instrumentation and Controls and all other types of auxiliary electrical wiring and cables at both ends with the specified heat shrinkable tags and heat shrink tags.
   2. Tag per Subsection 3.03 of this Section of the Specifications and per the OWNER's cable and wire tagging standards.
   3. Tag each wire in a Multi-Conductor cable in addition to the overall cable itself.
   4. Group wiring routed in pullboxes that are routed in common conduits and tag each wiring group inside each pullbox with nameplates as follows:
      a. Type: 3-ply, 1/8" thick, rigid thermoset phenolic resin laminated cellulose paper base engraving stock per ASTM D-709, Type I. Nameplates shall be ASTM Grade ES-1, ES-2, or ES-3 as applicable for the face and lettering colors specified hereinafter. Flexible or acrylic tags will be not be accepted.
      b. Color: White-Black-White.
      c. Lettering: 1/4 inch height, minimum, engraved through the face layer to the melamine middle layer.
      d. Accessories: Provide holes for mechanical fastening.

5. Secure each phenolic tag (where required) with a minimum of two nylon cable ties, one at each end of the tag.

F. Ground shielded instrument cables at one point only, i.e.; at the final destination in the associated instrument and control cabinets.

G. Terminate stranded wiring by use of lugs, clamps or pressure type terminals.

H. After all wiring connections have been made, the Contractor shall apply the Corrosion Resistant and Moisture Repelling Electrical Coating/Spray to all wiring connections. Coordinate application with the Owner prior to application, the Owner has the discretion to limit application. For bidding purposes, the minimum extent of spray application is further clarified as follows:
   1. Spray shall be applied for all terminations of the following types of connections at a minimum:
      a. termination points, terminals, terminal blocks, ground bar, neutral bar/bus,
      b. lugs of circuit breakers, buses, doors, etc.
      c. exposed/stripped ends of each conductor, etc.
      d. bolt-on connections, split-bolt connections, ring lugs, etc.
      e. submersible splice connectors, compression connectors, multi-cable connector blocks, etc.
      f. all other connection types not listed above
   2. Spray shall be applied for all terminations at the following types of equipment at a minimum:
      a. Local and main control panels, field instruments, junction boxes, field control stations, control relays, signal isolators, selector switches, pushbuttons, etc.,
      b. Panelboards, transformers, motor control centers, manual motor starters, contactors, light switches, light fixtures, etc.
      c. Motor termination enclosures, valve actuators, cathodic protection system, package control panels of process equipment, etc.
      d. Security system devices, cameras, roadway gate operators, etc.
      e. Convenience receptacles, scada receptacles, etc.
      f. All other types of equipment not listed above.

I. Additional requirements for armored cable installation:
   1. Furnish and install an armored cable termination fitting per Section 16150 for each armored cable termination point.
   2. Furnish and install supports for armored cable that are spaced in the appropriate intervals per the recommendations of the armored cable manufacturer and the NEC. Support channel and framing support system shall be per the conduit support requirements shown on the PLANS.
   3. Secure armored cable to support channel using UNISTRUT Cush-A-Clamp Assembly Pipe/Tube Clamp (1-5/8" Series), or approved equal, with controlled squeeze shoulder bolt for all clamping of armored cable.

3.02 TESTS

A. Perform all tests as outlined in Section 16800 and all other tests which are necessary to determine that the electrical wiring system is in satisfactory operating condition. Wiring shall be tested end-to-end after it is pulled in the conduit system.

3.03 WIRE TAGGING METHODOLOGY

A. Single Conductor Wire Tagging Scheme:
   1. All single conductor control and power wiring shall be tagged utilizing the source and destination method. In general, as minimum each tag shall be comprised of various fields which are:
      a. Device Identifiers,
      b. Terminal Numbers and,
      c. Equipment Identification name
   2. The following is the format that shall be used for each control power single conductor wire tag:

XXXX	-	XX	(XXXX-XXXX-XXXX	/	XXXX	-	XX)
Device Identifier		Terminal Number	Equipment Identification Name		Device Identifier		Terminal Number

      a. The tag information to the left refers to the point of termination. Tag information in parenthesis refers to the point of origination. Note: For wiring within the boundaries of a piece of equipment, The Equipment identification name shall not be required, only the Device Identifier and the Terminal Number from the point of origination. Examples to this exception would be, wiring from one terminal strip to another within the same control panel, etc.
   3. The following provides a brief description to each of the fields required within a single wire tag:

FIELD	DESCRIPTION
Device Identifier:	A four (4) alphanumeric character field that shall uniquely identify a device within a piece of equipment. Examples are: TB1, for Terminal Block Number 1, and CR02 for Control Relay #02, etc.
Terminal Number:	A two (2) alphanumeric character field that shall identify which specific point on the Device the wire must be terminated to. Refer to manufacturer's labeling or record drawings for Device Terminal Numbers.
Equipment Identification Name:	A twelve (12) alphanumeric character field that shall be the same as the physical Equipment Identification Nameplate attached to the equipment.

B. Single Conductor Wire Tagging Scheme in a Multi-conductor Cable:
   1. All single conductor control and instrument wiring (in Multi-conductor Instrument or Control Cables) shall be tagged utilizing the source and destination method. In general, each tag shall be comprised of various fields which are 1) Device Identifiers, 2) Terminal Numbers, and 3) Equipment Identification Name, as minimum.
   2. The following is the format that shall be used for each single conductor wire tag in a multi-conductor cable (Instrumentation or Control wiring Cables):

XXXX	-	XX	(XXXX	/	XX)
Device Identifier		Terminal Number	Cable ID		Conductor Number

a. The tag information to the left refers to the point of termination. Tag information in parenthesis refers to the point of origination.

3. The following provides a brief description to each of the fields required within a single tag (in a Multi-conductor Cable):

FIELD	DESCRIPTION
Device Identifier:	A four (4) alphanumeric character field that shall uniquely identify a device within a piece of equipment. Examples are: TB1, for Terminal Block Number 1, and CR02 for Control Relay #02, etc.
Terminal Number:	A two (2) alphanumeric character field that shall identify which specific point on the Device the wire must be terminated to. Refer to manufacturer's labeling or record drawings for Device Terminal Numbers.
Cable Identification (Cable ID):	A five (5) alphanumeric character field that shall uniquely identify a cable within the facility. The first character shall identify the cable type as follows: C - for Control Cables I - for Instrumentation Cables P - for Power Cables The remaining four (4) alphanumeric characters shall make-up a unique number for a given cable type within the facility.

C. Overall Cable Tag of a Multi-conductor Cable:

1. In addition to tagging each single conductor in a multi-conductor cable (as described in 3.03 B, above), the overall jacket of each multi-conductor cable shall also be tagged to uniquely identify each cable within the facility. In general, each cable tag shall be comprised of various fields which are 1) Cable Identification (Cable ID), and 2) Equipment Identification Name, as minimum.
2. The following is the format that shall be used for overall cable tag of each multi-conductor cable:

XXXX	(XXXX-XXXX-XXXX	/	XXXX-XXXX-XXXX)
Cable ID	Source Equipment Identification Name.		Destination Equipment Identification Name

a. The tag information to the left refers to the actual cable Identification (name). Tag information in parenthesis refers to the Identification Name of the Equipment at point of origination (source), followed by the Identification Name of the Equipment at the point of termination (Destination Point).

3. The following provides a brief description to each of the fields required within a cable tag:

FIELD	DESCRIPTION
- Cable Identification (Cable ID):	A five (5) alphanumeric character field that shall uniquely identify a cable within the facility. The first character shall identify the cable type as follows: C - for Control Cables I - for Instrumentation Cables P - for Power Cables The remaining four (4) alphanumeric characters shall make-up a unique number for a given cable type within the facility.
- Source Equipment Identification Name:	A twelve (12) alphanumeric character field that shall be the same as the physical Equipment Identification Nameplate attached to the source (origination) equipment.
- Destination Equipment Identification Name:	A twelve (12) alphanumeric character field that shall be the same as the physical Equipment Identification Nameplate attached to the destination equipment (equipment at point of termination).

4. All cable tags (except in Manholes, handholes, above ground cable closets, and in cable tray system), shall be of 3-ply engraved plastic (phenolic) with background color, letter sizes, etc. as follows:

Cable Type	Tag Color	Color of Lettering	Letter Height
600 volt Power Cable	Orange	White	3/16” (min.)
600 volt Control Cable	Orange	White	3/16” (min.)
Instrumentation Cable	Black	White	3/16” (min.)

3.04 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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SECTION 16250

BOXES AND CABINETS

PART 1 GENERAL

1.01 SUMMARY

A. Furnish and install all cabinets, junction boxes, pull boxes and outlet boxes as shown on the PLANS, required by the Specifications or National Electrical Code (NEC), or as otherwise necessary for a satisfactory operating system.

1.02 RELATED REQUIREMENTS

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the CONTRACTOR's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR's Work.

C. Related work as called for on the PLANS, as specified herein or in other Sections of the Specifications.

1.03 SUBMITTALS

A. Submit shop drawings in accordance with the Section 01300 of the Specifications.

B. Submit Operations and Maintenance Manuals (O&M) in accordance with Section 01730 of the Specifications. O&M Manuals shall include copies of the approved shop drawings, factory and on-site/field test data.

PART 2 PRODUCTS

2.01 JUNCTION AND PULL BOXES

A. Lighting and power, signal, telephone, voice communication, instrumentation and controls, and any other junction and pull boxes hereinafter specified or shown on the PLANS shall be as provided as follows:
   1. Outdoor boxes shall be NEMA-4X Type 316-Stainless Steel Boxes. Boxes shall be equipped with hinged doors complete with 1/4 (quarter) turn door latches.
   2. Indoor boxes in non-environmentally controlled rooms shall be as follows:
      a. All areas:
         1) Smaller than or equal to 12" wide x 12" high: 99.0% copper-free rigid Aluminum NEMA-4X corrosion resistant and water tight boxes.
         2) Larger than 12" side x 12" high: NEMA-4X Type 316-stainless steel Boxes.
      b. Boxes shall be equipped with hinged doors complete with 1/4 (quarter) turn door latches.

3. Indoor boxes in environmentally controlled rooms shall be as follows:
    a. NEMA 12 with ANSI No. 61 Gray finish
    b. Boxes shall be equipped with hinged doors complete with 1/4 (quarter) turn door latches.
4. Where shown on the PLANS, junction boxes shall be furnished with a full and solid backpanel (one piece full subpanel). The backpanel shall extend the full height and width of the cabinet/panel. The backpanel shall be factory painted white.

B. Boxes or cabinets shall be not less than 6-inches deep and their minimum height and width dimensions shall be determined by the requirements of, and in compliance with the NEC.

C. Each type of box and cabinet on the project shall be manufactured by a single manufacturer.

D. Manufacturer:
1. Hoffman Concept Series, Rittal, Millbank, or approved equal.

2.02 TERMINAL BLOCKS

A. Furnish terminal block assemblies in junction boxes where shown on the PLANS.

B. All terminal block assemblies shall be Type I Terminal Blocks as required in Section 17200 of the Specifications.

2.03 NAMEPLATES

A. General:
1. Type: 3-ply, 1/8” thick, rigid thermoset phenolic resin laminated cellulose paper base engraving stock per ASTM D-709, Type I. Nameplates shall be ASTM Grade ES-1, ES-2, or ES-3 as applicable for the face and lettering colors specified hereinafter. Flexible or acrylic tags will be not be accepted
2. Color: White-Black-White
3. Lettering: 1/4 inch height, minimum, engraved through the face layer to the melamine middle layer
4. Accessories: Provide holes for mechanical fastening. Provide adhesive backplane where required in Part 3, Execution.

PART 3 EXECUTION

3.01 APPLICATION

A. General:
1. Pullboxes shall be used only to reduce the number of bends for conduit, supports, taps, troughs and similar applications. No splicing shall be performed in pullboxes.
2. Junction boxes shall only be used where shown on the PLANS. Any other use of junction boxes other than for receptacle and lighting circuit wiring, is not permitted.

3. Outlet boxes shall be used for ceiling or wall mounting of light fixtures, receptacles, open type manual motor starters, and where required by the PLANS and Specifications to facilitate proper connection to equipment.

3.02 INSTALLATION

A. Set box square and true with building surfaces. Secure boxes firmly to support channels. Coordinate final location of boxes with other trades to avoid any conflicts.

B. Utilize specified support channels, then secure/mount boxes and cabinets to the support channels. All mounting hardware shall be Type 316-stainless steel. Equipment support channels shall be per the requirements of Section 16150 “Raceways, Fittings, and Supports”. Additionally, refer to details shown on the PLANS.

C. Tagging:
   1. Tag each box with the name as it appears on the PLANS using the specified namplates.
   2. Attach identification nameplates with two stainless steel screws.

D. Cap all outlets not used under this Contract with blank outlet covers.

E. Furnish and install labels as required by the NEC.

3.03 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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SECTION 16300

WIRING DEVICES

PART 1 GENERAL

1.01 SUMMARY

A. Furnish and install all necessary wiring devices at the locations indicated on the PLANS and as specified herein.

1.02 RELATED REQUIREMENTS

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the CONTRACTOR's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR's Work.

C. Related work as called for on the PLANS, as specified herein or in other Sections of the Specifications.

1.03 SUBMITTALS

A. Submit shop drawings in accordance with Section 01300 of the Contract Specifications. Include manufacturer's catalog data/notification certifying Aluminum Device Boxes, as specified hereinafter, to be 99.0% copper-free.

B. Submit Operations and Maintenance Manuals (O&M) in accordance with Section 01730 of the Contract Specifications. O&M Manuals shall include copies of the approved shop drawings, factory and on-site/field test data.

PART 2 PRODUCTS

2.01 120 VOLTS AC, COVENIENCE RECEPTACLES

A. Installed indoors inside the environmentally and climate controlled ELECTRICAL ROOMS:
   1. Receptacle
      a. Specification grade
      b. Duplex, 3-wire, polarized grounding type, rated 20 amp, 125 volt, 60 Hertz
      c. Ivory color
      d. Manufacturer: Hubbell No. HBL5362I, Bryant, Pass and Seymour, or approved equal.
   2. Ground Fault Interrupter Receptacle:
      a. Provide where G.F.I receptacles are indicated on the PLANS
      b. Specification grade, weather-resistant type,
      c. Duplex, 3-wire, polarized grounding type, rated 20 amp, 125 volt, 60 Hertz.

d. Red indicator light
e. Test and Reset pushbutton
f. Ivory color.
g. Manufacturer: Pass & Seymour Cat. No. 2095TRWR, or approved equal.

3. Box: Provide as hereinafter specified.

B. Installed indoors inside STORAGE ROOMS and PROCESS MECHANICAL EQUIPMENT ROOMS and installed in ALL OUTDOOR AREAS:
1. Specification grade
2. 2-wire, 3-pole, rated 20 amp, 120 volt,
3. Twist-lock, factory-sealed, pin and sleeve
4. Internal horsepower and AIC-rated switch that shall activate only after the Plug is inserted into the receptacle and twisted.
5. Dead-front, mechanically interlocked where plug cannot be engaged or disengaged under load.
6. Brass receptacle blades/contacts
7. Watertight, raintight and corrosion resistant and rated for use in Class I Division 2 hazardous areas.
8. Fully gasketed, watertight, dustight and corrosion resistant twist-on cover.
9. Type 12 nylon enclosure with 316 stainless steel hardware
10. Manufacturer: Cooper Crouse-Hinds Series IEC-309 Hazardous Area Receptacles/Plugs and Interlocks, Factory-Sealed, TYPE GHG Pin and Sleeve receptacles complete with device boxes and specified accessories.
11. Furnish and install a total count of Two (2) Sets of completely assembled matching CORD and PLUG assembly for the Pin and Sleeve Receptacles. The cord and plug assembly (of each set) shall consist of:
    a. Matching Male Plug manufactured by Cooper Crouse-Hinds Series IEC-309 Hazardous Area Plugs and Interlocks, Factory-Sealed, TYPE GHG Pin and Sleeve Twist-On plug
    b. 25-feet of #12AWG, 3-conductor extra-flexible Type SO-CORD power cord (each conductor shall be 100%-conductive-soft-copper conductors with 41-strands).
    c. NEMA 5-20R Female Connector, 20-amp, 125 volt rated having tin-plated-copper spade-connectors.

2.02 DEVICE ENCLOSURES AND COVERPLATES

A. Installed indoors inside the environmentally and climate controlled ELECTRICAL ROOMS:
1. Enclosures for exposed surface mounted devices:
    a. Sand Cast Aluminum, 99.0% copper-free, one piece construction, suitable for surface mounting
    b. Single and Multi-Gang Weatherproof Outlet boxes, as required.
    c. 3/4-inch threaded hubs, minimum box depth shall be 2-5/8". Use 2-3/4" depth when "gang" arrangements of outlets are used.
    d. Manufacturer: Crouse-Hinds Series FS or FD, Appleton, or approved equal.
2. Coverplates:
    a. Receptacles: Die Cast Aluminum 99.0% copper-free, complete with rubber gasket, as manufactured by Crouse-Hinds WLRS (single cover), WLRD (duplex cover), WLGF-FS and WLGF-FSV (GFCI cover) or approved equal.

B. Installed indoors inside STORAGE ROOMS and PROCESS MECHANICAL EQUIPMENT ROOMS and installed in ALL OUTDOOR AREAS:
   1. Enclosures:
      a. Sand Cast Aluminum, 99.0% copper-free, one piece construction, suitable for surface mounting
      b. Single and Multi-Gang Weatherproof Outlet boxes, as required.
      c. 3/4-inch threaded hubs, minimum box depth shall be 2-5/8". Use 2-3/4" depth when "gang" arrangements of outlets are used.
      d. Manufacturer: Crouse-Hinds Series FS or FD, Appleton, or approved equal.
   2. Coverplates:
      a. Receptacles: See Part 2.02 B this Section of the Specifications.

2.03 MISCELLANEOUS

A. All mounting hardware shall be Type 316-stainless steel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Mounting: Device enclosures shall be surface mounted on conduit support channels per Section 16150 and as shown on the PLANS.

B. Mounting heights shall be as follows unless otherwise noted on the PLANS:
   1. Receptacles: 36 inches above finished floor to center of receptacle.

C. Tagging:
   1. Tag all receptacles
   2. Tagging format: "ckt. LPY-XX" where Y represents the panel number (e.g. for panel "LP-01", Y is 1) and XX represents the circuit number. Add voltage if other than 120V.
   3. Tag type:
      a. Type: 3-ply, 1/8" thick, rigid thermoset phenolic resin laminated cellulose paper base engraving stock per ASTM D-709, Type I. Nameplates shall be ASTM Grade ES-1, ES-2, or ES-3 as applicable for the face and lettering colors specified hereinafter. Flexible or acrylic tags will be not be accepted.
      b. Color: White-Black-White.
      c. Lettering: Engraved through the face layer to the melamine middle layer.
      d. Accessories: adhesive backplane.

D. Provide 6-inches offset for receptacles or other wiring devices mounted on opposite sides of a wall.

E. Set box square and true with building surfaces.

F. Maintain symmetry of all devices as closely as possible within the Architectural Section contained. For example, center a receptacle in a section of wall, if shown in that approximate position.

G. Verify location of receptacles in finished rooms. In centering devices and locating device boxes, allow for overhead pipes, and mechanical equipment; etc., and correct any inaccuracy from failure to do so without extra expense to the OWNER.

H. Cap all device boxes not used under this Contract with blank outlet covers.

3.02 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

SECTION 16540

FIELD CONTROL STATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Furnish and install field control stations as specified herein and as shown on the PLANS.

1.02 RELATED REQUIREMENTS

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the CONTRACTOR's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR's Work.

C. Related work as called for on the PLANS, as specified herein or in other Sections of the Specifications.

1.03 SUBMITTALS

A. Submit shop drawings in accordance with the Section 01300 of the Specifications.

B. Submit Operations and Maintenance Manuals (O&M) in accordance with Section 01730 of the Specifications. O&M Manuals shall include copies of the approved shop drawings, factory and on-site/field test data.

1.04 SPARE PARTS

A. Furnish 25% spare indicating pilot light assemblies for each type used (minimum of 1 per type).

B. Furnish 50% of spare indicating pilot light lenses and lamps for each type and color size and type used (minimum of 2 per type).

PART 2 PRODUCTS

2.01 PUSHBUTTONS, SELECTOR SWITCHES, PILOT LIGHTS

A. General:
   1. Rating: NEMA 4X/13, heavy duty, oil tight/corrosion resistant and rated for use in wet locations.
   2. Size: NEMA Style full size 30-millimeter (30mm)
   3. Contacts: 10 ampere minimum at 120 volts A.C. Stackable contact blocks. Provide number of contacts to satisfy the requirements of the PLANS.

4. Legend Plate: Provide per manufacturer's standard with inscription as shown on the PLANS.
5. Manufacturer: Allen Bradley Bulletin 800H, or approved equal.

B. Additional Requirements for Selector Switch/ Pushbuttons:
1. Operator Color: Black, unless shown otherwise on the PLANS.
2. Selector Switch Action Type: Maintained action, unless shown otherwise on the PLANS.
3. Pushbutton Action Type: Momentary action, unless shown otherwise on the PLANS.

C. Additional Requirements for Pilot Lights:
1. Type: Transformer Type Light Emitting Diode (LED)
2. Voltage: 120 volts A.C.
3. Style: Push-to-test
4. Lens Color: Provide the colors as shown on the PLANS:

D. Additional requirements for Emergency Stop/Trip Push-Button Stations:
1. Action Type: Push-Pull maintained
2. Operator Type: Mushroom head
3. Operator Color: Red, unless shown otherwise on the PLANS
4. Each button shall be provided with a hinged polycarbonate corrosion resistant locking cover. Cover shall be capable of closing without actuating the push button. Cover shall be C3 Controls Model LOAFC, or approved equal.
5. Padlock: Furnish and install padlock with 0.25 inch diameter padlock shackle. Coordinate the shackle diameter with the padlock attachment. Furnish and install padlock as manufactured by Master Lock, or approved equal.

2.02 FIELD CONTROL STATION ENCLOSURE

A. Size: As required

B. Rating: NEMA-4X

C. Material: Type 316 Stainless Steel.

D. Doors and door latches: Boxes shall be equipped with hinged doors complete with 1/4 (quarter) turn door latches.

E. Manufacturer: Allen-Bradley, Hoffman, Rittal, Millbank, or approved equal.

2.03 LEGEND PLATES/NAMEPLATES FOR CONTROL STATIONS

A. General:
1. Provide nameplates/legend plates for each control station, and each pilot device installed in a control station as shown on the PLANS and as previously specified.

B. Identification Nameplates:
1. General: Furnish and install identification nameplates for each field control station as follows unless shown otherwise on the PLANS
a. Type: 3-ply, 1/8" thick, rigid thermoset phenolic resin laminated cellulose paper base engraving stock per ASTM D-709, Type I. Nameplates shall

be ASTM Grade ES-1, ES-2, or ES-3 as applicable for the face and lettering colors specified hereinafter. Flexible or acrylic tags will be not be accepted.

b. Color: White-Black-White
c. Lettering: 1/4-inch height minimum unless shown otherwise on the PLANS, engraved through the face layer to the melamine middle layer.
d. Accessories: Provide holes for mechanical fastening
e. Attachment Means: Secured with two Stainless Steel screws.

PART 3 EXECUTION

3.01 INSTALLATION

A. Minimum mounting height shall be 3-foot 6-inches above finished floor unless shown otherwise on the PLANS. Secure stations firmly to support channels as specified in Section 16150 “Raceways, Fittings and Supports”.

3.02 FIELD TESTING

A. Perform field testing as required elsewhere.

3.03 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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SECTION 16550

GROUNDING

PART 1 GENERAL

1.01 SUMMARY

A. Provide grounding in accordance with the PLANS, these Specifications and the National Electrical Code “N.E.C.” Included within this section are furnishing and installing all the wire, connections, and other devices associated with the grounding system associated with the aforementioned.

1.02 RELATED REQUIREMENTS

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the CONTRACTOR’s responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR’s Work.

C. Related work as called for on the PLANS, as specified herein or in other Sections of the Specifications.

1.03 SUBMITTALS

A. Submit shop drawings on all grounding system product and in accordance with Section 01300 of the Specifications. Include material safety data sheet for ground enhancement material.

PART 2 PRODUCTS

2.01 GENERAL

A. Equipment and/or static voltage and/or any other ground buses/bars (for any other type of use) called for on the PLANS and Specifications shall be tin-plated copper.

PART 3 EXECUTION

3.01 GENERAL:

A. Ground all electrical and instrumentation equipment, including lights, receptacles, instruments, etc., with a separate equipment ground wire installed in the conduit with the power conductors.

B. Install grounding system electrically and mechanically continuous throughout. System neutral shall be bonded only at the building service transformer.

C. Connect equipment grounding conductors to ground bars or busses provided at panelboards, motor control centers, disconnect switches, switchgears, etc., from which the equipment is served.

D. Where the equipment has no facility to attach an equipment ground wire, use a Burndy Quicklug or equal. Clean the metal surface under the lug to bright metal so that good contact can be made. Repaint metal surfaces after the lug and connecting ground wires are installed.

E. Make ground connections to equipment by using ground lugs or ground bars, where they are provided.

F. Furnish bonding jumpers as shown or as otherwise required by the National Electrical Code "N.E.C." Use stranded copper wire.

G. Inside buildings and at above ground level and through concrete floor slabs, route the ground wire(s) in a conduit raceway system. Fill annular space between ground wire and conduit with Crouse Hinds, Nelson or Raychem watertight and flame-retardant sealant.

H. Connect ground wires entering outlet boxes in such a manner that removal of the receptacle will not interrupt the continuity of the grounding circuit. A grounding screw attached to the box, and used for no other purpose, may be used to accomplish this.

I. After ground wire connections have been made to equipment, to instruments, to devices, etc., the Contractor shall apply "3M" 1601 Clear-Color Fast Drying Sealer and Insulator, or approved equal corrosion resistant and moisture repelling electrical coating/spray to all exposed wiring and all wire connections. Coordinate application with the Owner.

J. Install a bonding jumper from the grounding lug of each Conduit-Grounding-Bushing to the ground bar or bus of each enclosure and/or equipment housing (such as pull boxes, junction boxes, panelboards, motor control centers, transformers, automatic transfer switches, instrument and control panels, etc.), as applicable. Instrument Grounds to be separate from power grounds. Instrument ground to be insulated up to the connection to the ground grid. Also refer to details shown on the Drawings. Bonding jumper wire for Conduit system Grounding-Bushings shall be <u>STRANDED</u> bare copper wire with minimum of 19-strands. Bonding jumper wire size as required by the National Electrical Code "N.E.C.", however, minimum wire size shall be #10 AWG.

3.02 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

SECTION 16800

CALIBRATION, TESTING AND SETTINGS

PART 1 GENERAL

1.01 SUMMARY

A. Provide all equipment and labor required for calibration, setting and testing as described herein or otherwise required. All tests shall be witnessed by the OWNER or the OWNER's designated representative. Give written notification of the tests at least seven days prior to the desired date to perform the tests. Repair or replace all defective material, equipment or workmanship disclosed as a result of these tests at no cost to OWNER.

B. All work, including installation, connection, calibration, testing, and adjustment, shall be accomplished by qualified, experienced personnel working under continuous, competent supervision. The completed installation shall display competent work, reflecting adherence to prevailing industrial standards and methods.

C. Tests: The Contractor shall make all tests required by these specifications, or other authorities having jurisdictions. All such tests shall be performed in the presence of the OWNER or the OWNER's designated representative. The Contractor shall furnish all necessary testing equipment and pay all costs of tests, including all replacement parts and labor necessary due to damage resulting from damaged equipment or from test and correction of faulty installation.

1.02 SUBMITTALS

A. Submittals shall include copies of the test results/reports. Submittals shall be per the quantity and format requirements of Section 01300 and 01730 of the Specifications. Include the following at minimum:
   1. Test results, inclusive of catalog number/drawing cross-reference, where applicable, and any other data entered on the field test report
   2. Testing Plans
   3. All test instrument data sheets and calibration certificates

1.03 TEST PLAN AND TEST RESULTS

A. Performance: Testing shall be performed in compliance with the approved Test Plan. The Test Plan shall be submitted in accordance with the outline given below. Provide the OWNER with typewritten results of all tests, including a description of the equipment tested, the date and time of day tested, names of witnesses, weather conditions; and test values and results.

B. Test plan: At minimum, Submit a Test Plan for each of the Sections listed in Division 16 of these specifications. Test Plan shall be submitted at least two (2) weeks prior to the desired date and time of the test. Test Plan shall clearly identify the following, as applicable:
   1. Desired date and time to perform the test

2. Name of Entity/individual that shall perform the test
3. Test procedures and recording data sheets
4. Name, description, catalog number, calibration date, and calibration entity's name of each of the test instruments to be used in executing the test
5. Expected duration of the test
6. Request for type, time and duration of any shutdown that may be required during the test.

C. Test Results:
Submit Test Results for each of the Sections listed in Division 16 of these specifications. Test Results shall be submitted no later than at least two (2) weeks after the last date of the respective test. Test Results shall be typewritten and shall include the following, as minimum:

1. All data and information provided in the Test Plan
2. Name of Entities and individuals that attended and witnessed the test
3. Weather Conditions
4. Tabulated test values and results
5. Corrective measures taken and/or to be taken toward defective material, equipment or workmanship disclosed as a result of these tests. Also include Re-Test dates and procedures for defective material, equipment or workmanship disclosed from the previous test.

1.04 TEST EQUIPMENT

A. Each test instrument shall have been certified by an established calibration laboratory within the six (6) months prior to its use in testing and calibration procedures. Calibration shall be traceable to the National Institute of Standards and Technology (NIST).

PART 2 PRODUCTS

A. No products are required by this Section of the Specifications.

PART 3 EXECUTION

3.01 INSULATION RESISTANCE (MEGGER) TESTS:

A. Use a minimum 500 volt megohmeter.

B. Take each reading for at least one minute.

C. Include the following tests:

Equipment	Minimum Resistance
115 and 230 volt motors	5.0 Megohms
460 volt motors	7.0 Megohms
600 volt transformer winding	100.0 Megohms
600 volt wiring up to 1000 ft.	25.0 Megohms

Coordinate minimum values shown with equipment manufacturer's recommendations.

D. Test all transformer windings as follows:
   1. Primary to ground
   2. Secondary to ground
   3. Primary to secondary

E. Record and submit all Megger readings to the OWNER/ENGINEER for review and record keeping purposes. Neatly type all readings and organize in a Database table form. Incremental megger readings shall also be recorded and included in the table.

F. Test medium voltage cables in accordance with Section 16182 "Medium Voltage Cables.

3.02 GROUND TEST

A. Ground System testing shall be performed by an independent professional testing company specialized in, and well equipped to perform, ground resistance testing.

B. Ground testing shall assure resistance to ground values listed in the Grounding Specification. All tests must be witnessed by the Owner or the Owner's designated representative.

C. At a minimum, test each of the following separately, with ground under test isolated from other grounds:
   1. Each process area/building grounding network, i.e., Thickener Building, etc. Furnish and install additional grounding/ground electrodes if the resistance to ground measures more than the values stipulated in the Grounding Section of the Specifications. This shall be executed at no additional cost to the Owner.
   2. Each manhole,
   3. Each handhole,

D. Finally, after all tests of each individual process area/building, manhole, handhole, etc., are performed as previously specified, perform a final test after all of the individual process areas/buildings, manholes, handholes, etc. grounding networks are interconnected as also shown on the PLANS.

3.03 MOTORS

A. Test the insulation resistance (megger test) of all motors installed under this Contract inclusive of process mechanical drive motors and the Heating and Ventilation System drive motors such as exhaust fans, fan and coil units drive motors, etc. Test all motors in accordance to with subsection 3.01 above.

B. Dry out any wet insulation by use of space heaters or other approved methods.

C. Check coupling alignment, shaft end play, lubrication, and other mechanical checks as required. Follow manufacturer's instructions.

D. Check for proper motor rotation.

3.04 RECEPTACLES

A. Test all receptacles for proper connections and grounding. Use an approved plug-in tester equal to Woodhead 1750 or Hubbell 5200.

3.05 CONTROL CIRCUITS

A. Check all circuits for continuity, proper connection, and proper operations.

B. Set all time delay relays and timers for the desired operations. Record the settings, indicating the relay or timer, its location, and the setting used. Verify all settings with a stopwatch.

3.06 CONTINUITY TESTS

A. Perform continuity test on all low voltage conductors (600 volt, and below, wiring system). Continuity test must be performed after wiring is pulled in the conduit system and/or underground electrical system (as applicable). Continuity test must be performed on each conductor between its source and final destination (point of termination to load/device/etc.). Utilize Ohmmeter for this test. Ohmmeter must be set to lowest ohm setting (highest resolution).

3.07 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

SECTION 17100

PROCESS INSTRUMENTATION AND CONTROL SYSTEMS (PICS)

PART 1 GENERAL

1.01 SUMMARY

A. Provide all labor, materials, and equipment to design, furnish, install, calibrate, test, adjust, and place in operation the facility complete monitoring and control system as specified herein and as shown on the PLANS. The PLANS and Specifications show and specify those features required to illustrate and describe functional requirements of the monitoring and control system.

B. A single Instrument and Control System Contractor (ICS) shall furnish all services and equipment defined herein and in other Specification sections as listed below under Related Work. The Instrument and Control System Contractor is referred to herein and after (in Division 17 of the Specifications) as the ICS, ICS supplier/firm, or Contractor. The ICS shall have the qualifications as described in subsection 2.0, "Quality Assurance", this Section of the Specifications.

C. The ICS shall also:
   1. Terminate and tag all field wiring associated with the process instrumentation and control system shown on the PLANS and specified herein and in other Specification sections listed below under Related Work**.**
   2. Tag Instrumentation and control wiring/cable per the requirements and methodology/scheme outlined in specifications Section 16200 "Wiring (600 Volts and Below)" paragraph 3.03 "Wire Tagging Methodology".
   3. Calibrate, set and test the PICS equipment, components, cables, hardware, and software.
   4. For all PICS equipment and ancillaries, provide:
      a. Required submittals.
      b. Equipment and ancillaries.
      c. Instructions, details, and recommendations to, and coordination with, all other installation entities for Certificate of Proper Installation.
      d. Certifying readiness for operation.
      e. Starting up.
      f. Testing.
      g. Training
      h. Use of testing/calibration equipment to facilitate calibration/testing of field sensors and instruments. Equipment shall include, but not be limited to:
         1) Test pressure pump for field calibration/testing of pressure transmitters.
         2) Signal generator/multi-function meter for field calibration/testing of resistance temperature detector (RTD) monitoring devices
         3) Temperature/heat generator for field calibration/testing of temperature transmitters.
         4) Shaker table for vibration transmitters, etc.

5. Provide special additional services during installation, including:
    a. Verifying that the following are furnished and installed:
        1) Correct type size, and number of signal wires with their raceways.
        2) Correct electrical power circuits and raceways.
        3) Correct size, type, and number of PICS related pipes, valves, fittings, and tubes.
        4) Correct size, type, materials, and connections of process mechanical piping for in-line primary elements
    b. For equipment not provided by the ICS, but directly connected to the PICS:
        1) Obtain manufacturer's information regarding installation, interface, function, and adjustment for equipment from the Contractor.
        2) Coordinate with Contractor to allow required interface and operation with the PICS.
        3) Verify that installation, interfacing signal terminations, calibration, and adjustments have been completed in accordance with the manufacturer's recommendations.
        4) Test to demonstrate the required interface and operation with the PICS.
        5) Examples of equipment in this category include, but are not limited to the following:
            a) OWNER's Top-End Computer System
            b) Motorized Valve Operators
            c) Motor Control Centers
            d) Process/Mechanical Equipment
6. Assist OWNER/ENGINEER, as specified in applicable DCS subsystem specifications sections, in the PAT testing of the Applications Software which shall be developed by OWNER/ENGINEER for the DCS (as applicable).

D. The Distributed Control System at the Electrical Room of the Inlet Facility are networked with the OWNER's existing plant Top-End computer system by means of DCS equipment at the OWNER's existing Control Panels. Effort is required of the ICS to maintain a functional and complete communication network links between the proposed equipment of this project and the Owner's existing DCS equipment in order to achieve proper and complete system operation. This effort shall include, but not be limited to:
    1. Coordination with all responsible parties, i.e. OWNER, manufacturers, etc., to facilitate proper cable termination, locations in controls panels, etc., as required
    2. System startup testing, diagnosing, and resolving communication system issues, etc.

E. Extensive field verification is required for all modifications to existing control panels. The ICS shall include effort associated with field verifying spatial dimensions inside the existing control panels for proposed equipment, wiring terminations, loop power supply sizes, loads on existing instrument loops, points of connections to existing equipment, etc. as required to support the proposed modification effort associated with this project. The ICS shall field locate proposed equipment to be installed inside the existing control panel as also shown on the PLANS. The proposed location shall be coordinated with the arrangement of the existing control panel internal and externally mounted components.

F. The OWNER's existing distributed control system is vital to the OWNER's treatment plant process system. Therefore, required interruptions to the OWNER's existing distributed control system shall be minimized and coordinated with the OWNER. Should an outage to a facility be required, the Contractor shall request such an outage in writing no less than ninety-six (96) hours in advance. Contractor's written request shall identify the desired date, time, duration, and purpose of the requested day unless he/she obtains a written approval from the owner authorizing the outage. The OWNER reserves the right to modify or reject any request such an outage. Modification or rejection of the contractors request be the OWNER shall not be considered reason for delays in the construction schedule. Unless otherwise noted, the duration of the outage shall be limited to four (4) hours or less. The OWNER reserves the right to limit the duration of the outage to less than 4 hours. Modification of the outage duration by the OWNER shall not be considered reason for delays in the construction schedule.

G. The OWNER's existing distributed control system equipment and its associated interconnect wiring, power supplies, fuses, etc., is in perfect working condition. Should the existing equipment, its associated interconnect wiring, power supplies, fuses, etc., as applicable, be damaged or become otherwise unusable during the construction course of this project, the ICS shall determine the problem, correct it, and furnish and install all necessary wiring/hardware/etc., to match existing and make all final connections such that all affected equipment operates as previously operated to the OWNER's satisfaction at No Additional Cost to the OWNER.

1.02 RELATED REQUIREMENTS

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the CONTRACTOR's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR's Work.

C. Division-16 ELECTRICAL SPECIFICATIONS

D. Division-17: INSTRUMENTATION AND CONTROL SPECIFICATIONS

E. All other divisions of the Specifications related to the installation of the process mechanical equipment, etc. that are related to the operation of the instrumentation and control system.

F. Related work as called for on the PLANS, as specified herein or in other Sections of the Specifications.

1.03 SUBMITTALS

A. General: Do not design, manufacture, or ship any PICS equipment until all related submittals have been reviewed and approved by the ENGINEER. Submit shop drawings and product data in complete functional packages; i.e., submit all shop drawings and product data for a given loop or subsystem together as a functional package. Piecemeal submittals not organized by systems or incomplete submittals for a given loop or subsystem will not be accepted.

B. Administrative Submittals:
   1. Schedule of Values
      a. Purpose: Project Schedule of Values to provide a basis for Partial Payment for Work completed.
      b. Content: Summary of major milestones and associated Partial Payments for Work provided under PICS Subsystems.
   2. PICS Progress schedule
      a. Purpose: Supplement the overall Project Progress Schedule to:
         1) Coordinate activities between the Contractor and the ICS
         2) Coordinate interactions with the OWNER/ENGINEER for coordination meetings, submittal reviews, etc.
         3) Clarify required work sequences and major milestone prerequisites.
      b. Provide multiple submittals of the project schedule throughout the duration of the Project as required.
   3. OWNER Training Plan: Submit description/schedule of OWNER Training to be provided.
   4. Statements of Qualification: Submit for PICS firm, site representative, start-up and testing team member.

C. Submit shop drawings in accordance with Section 01300 of the Specifications and as specified below:
   1. Detailed product data, catalog cut sheets, cabinet exterior and interior front elevations, bill of materials, and spare parts list
   2. Point-to-Point Wiring Diagrams: Prepare Point-to-Point Instrument Loop Wiring Diagrams, ladder diagrams (control schematics), cabinet wiring, and other field wiring diagrams in accordance to the format shown on the PLANS. Drawings shall be neat, and legible, and on 11 inch x 17 inch sized sheets. Drawings to include all relevant information for equipment connected to the PICS, regardless if the equipment is provided by the ICS or not, i.e., include motor control centers, OWNER pre-purchased equipment, etc. where controls interconnection is required with the same. Contractor shall also submit for approval a complete schedule of all wire tag numbers sorted by area and equipment/instrument/field device.
   3. Although typical control schematics/instrument loops are presented on the PLANS for some equipment, the Contractor shall generate specific equipment control schematic drawings/instrument loops (i.e., individual control schematic/instrument loop drawings dedicated for each specific equipment) based upon the typical control schematic/instrument loop drawings, the device identification/tag replacement schedules shown on the PLANS, and the additional requirements described herein. The Contractor generated specific equipment control schematics/instrument loops shall follow the same overall presentation format as the typical equipment control schematics/instrument loops presented on the PLANS. The specific equipment control schematics/instrument loop drawings complete with all specific equipment/device tags (as a minimum, also refer to the additional requirements described herein) shall be generated by the Contractor and included with the project submittals (i.e., prior to equipment purchase) and the “As-Built” drawings. Any Contractor generated control schematic/instrument loop shown as applicable for multiple equipment shall not be accepted.
   4. Contractor may submit wire tag samples for all types of interconnect and field wiring from the proposed/existing cabinets/panels with associated point-to-point wiring diagrams in a separate submittal for approval prior to submitting

the complete wire tag schedule for review. After approval of the sample wire tags, a wire tag table showing all provided wire tags shall be submitted for review with the associated point-to-point wiring diagrams. Refer to Specification 17100 Subsection 1.03.C.5 for additional wire tag table requirements. Refer to Specification 16200 Subsection 3.03 for wiring tagging methodology.

5. Wire Tags: Contractor shall also submit for approval a complete schedule of all wire tag numbers sorted by area and equipment/instrument/field device. It is anticipated that all wire numbers cannot be accommodated on the loop diagrams, ladder diagrams, control schematics, etc. format shown on the PLANS. As a minimum, to facilitate the depiction of the wire numbers on the loop diagrams, ladder diagrams, control schematics, etc., the Contractor shall generate and include uniquely identified alpha-numeric wire codes on the loop diagrams, ladder diagrams, control schematics, etc. The wire codes shall cross-reference tables of wire numbers shown on additional drawings that shall be generated by the Contractor. At minimum, the Contractor shall generate the wire codes and the cross-reference tables which depict the wire numbers associated with each wire code and shall group the cross-reference tables by specific equipment (Gate No. 1, Gate No. 2, Gate No. 3, etc.). As a minimum, the Contractor shall generate drawings to depict the wire code and wire tag cross-reference tables and these drawings shall also be grouped by specific equipment (Gate No. 1, Gate No. 2, Gate No. 3, etc.). Contractor shall submit wire tag samples for all types of interconnect and field wiring from the proposed/existing cabinets/panels with associated point-to-point wiring diagrams in a separate submittal for approval prior to submitting the complete wire tag schedule for review.

D. Testing Related Submittals:
   1. Submit factory and field calibration reports
   2. Submit the following for each of type of test (ORT and PAT) required under Division 17 of the Specifications:
      a. Preliminary Test Procedures: Outlines of proposed tests, forms, and checklists.
      b. Final Test Procedures: Proposed test procedures, forms, and checklists.
      c. Test Documentation: Copy of signed off test procedures when tests are completed.

E. Training Related Submittals:
   1. Submit the following for each type of training required under Division 17 of the Specifications:
      a. Training plan, course topics, subjects to be addressed in the training
      b. Schedule
      c. Training agenda for each course
      d. Instructor qualifications
      e. Listing of available training courses and outline of course topics and agendas

F. Submit Operation and Maintenance manuals in accordance with Section 01300 and 01730 of the Specifications and as specified below:
   1. Include approved shop drawing data in the Operation and Maintenance manuals with the following modifications to the shop drawing exhibits:
      a. Reflect “As-Built” conditions.
      b. Prints of exhibits, wiring diagrams, etc. shall be half size (11 inch by 17 inch).
   2. Procedures for operating and shut-down
   3. Included approved Testing Related Submittals with final “As-Built” conditions.
   4. Safety instructions.
   5. Calibration instructions and factory test results of each instrument.
   6. Maintenance and repair instructions.
   7. Recommended spare parts list.
   8. Name, address and phone number of instrumentation control system supplier's local representative.
   9. Additionally, comply with the requirements of the Contract Documents.

1.04 SPECIAL CONDITIONS

A. All components used in the instrument and control systems shall be new (not used) and the current model produced by the manufacturer.

B. All equipment of a common type shall be the product of a single manufacturer.

PART 2 QUALITY ASSURANCE

2.01 ACCEPTABLE PROCESS INSTRUMENTATION AND CONTROL SYSTEM (PICS)

A. Provide a complete, workable, and installed-in-place Process Instrument and Control System, hereinafter referred to as the PICS, as specified herein. The PICS shall be designed, installed, and started up by the single ICS firm.

B. Acceptable ICS firm shall have the following minimum qualifications:
   1. ICS Firm: Minimum of 5 years experience in providing, integrating, installing, testing, and start-up similar systems as those required for this project
   2. ICS Firm Site Representative: Minimum of 8 years experience installing similar systems as those required for this project
   3. ICS Firm Start-up and Testing Team Members: Minimum of 3 years experience in testing systems similar to those required for this project.

C. PICS meetings to be scheduled in accordance with the Contract Documents.

2.02 SYSTEM COORDINATION AND QUALITY

A. Coordinate installation of instrumentation with mechanical and electrical systems.

B. Coordinate subsystems to provide a complete operational and functional instrumentation system to the satisfaction of the OWNER and ENGINEER.

C. Equipment, instruments, components, and materials for PICS components shall be new (not used) and of the current model.

D. Instrument and Control Components Furnished By Others: Certain items of instrumentation and controls shall be furnished by various equipment manufacturers. Coordinate the purchase orders of the items such that the resulting system will function properly.

2.03 DESIGN CRITERIA

A. Design, construct, and install all PICS components in compliance with the applicable provisions of the following standards, codes, and regulations:
   1. American National Standards Institute (ANSI) Standards.
   2. American Institute of Steel Construction (AISC) Standards.
   3. American Society for Testing and Materials (ASTM) Standards.
   4. American Waterworks Association (AWWA) Standards.
   5. Joint Industrial Council (JIC) Standards.
   6. National Electric Code (NEC)
   7. National Electrical Manufacturer's Association (NEMA) Standards.
   8. Local and State Building Codes.
   9. Occupational Safety and Health Administration (OSHA) Regulations.
   10. Scientific Apparatus Manufacturer's Association (SAMA) Standards.
   11. International Society of Automation (ISA) Standards.
   12. National Fire Protection Association (NFPA)
   13. Institute of Electrical and Electronics Engineers (IEEE).

2.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery: Enclose cabinets and subassemblies in heavy polyethylene envelopes to protect them from dust and moisture. Place corrosive-inhibitive vapor capsules in shipping containers, and related equipment as recommended by the capsule manufacturer.

B. Storage: All materials and equipment shall be environmentally protected and stored in climate controlled (temperature and humidity, etc.) environment. The Instrument Control Panels and the field control and instrument/monitoring panels shall not be moved `from climate controlled storage room to the project site until the construction of each electrical/control room is completed, and, the air-conditioning and heating system of the facility is in an operating condition satisfactory to the OWNER and ENGINEER.

2.05 CALIBRATION INSTRUMENTS

A. Each instrument used for calibrating PICS equipment shall bear the seal of a reputable laboratory certifying that instrument has been calibrated within the previous twelve (12) months to a standard endorsed by the National Institute of Standards and Technology (NIST). At OWNER’s request, ICS shall submit calibration certification report.

2.06 START DATE OF THE PROCESS INSTRUMENTATION AND CONTROL SYSTEM AND ASSOCIATED SUBSYSTEM WARRANTY (PICS INCLUDING SUBSYSTEMS)

A. Start Date of the process instrumentation and control system and associated subsystem Warranty (PICS including Subsystems) shall commence the date in

which the Warranty period commences for the overall project per the requirements of the Procurement Documents.

PART 3 SEQUENCING AND SCHEDULING

3.01 GENERAL

A. All work provided under this section shall be in accordance with the OWNER/ENGINEER-approved Schedule of Submittal Submissions and Schedule of Values.

B. Specification and Construction Implementation Plan requires phased installation of equipment and systems. Stage all PICS activities (submittals, fabrication, installation, testing, start-up, training, etc.) to support the construction sequencing requirements of the project.

C. Wherever language in this section refers to the PICS, the entire installed PICS, the entire PICS, or similar language, it shall be interpreted to apply to the individual phases of the work; except the requirements for the Performance Acceptance Test (PAT).

D. Key milestone dates associated with PICS activity shall be included in the overall project schedule. Include the following dates as a minimum:
   1. ORT start and end date
   2. PAT start and end date
   3. Training dates

3.02 PREREQUISITE ACTIVITIES AND LEAD TIMES:

A. Start the following key Project activities when prerequisite activities and lead times listed below have been completed and satisfied:
   1. Test Prerequisite:
      a. All associated process and mechanical equipment, controlled and monitored by the instrumentation and control system, complete in place
      b. Associated test plan submittal completed. For ORT and PAT, notice of test schedule required 4 weeks prior to the start of test
   2. ORT Prerequisite:
      a. Approved ORT test procedures
      b. Approved ORT test forms
      c. 30 calendar days advance written notice to given to OWNER of impending ORT.
   3. PAT Prerequisite:
      a. ORT successfully completed.
      b. Approved PAT test procedures
      c. 30 calendar days advance written notice to given to OWNER of impending PAT.
   4. O&M submittal prerequisite: PAT successfully completed.

PART 4 PRODUCTS

4.01 GENERAL

Refer to requirements of PICS Subsystem provided in Division-17 Specifications.

4.02 SOURCE QUALITY CONTROL

A. General:
   1. Test all PICS elements, both hardware and specific software, to demonstrate that PICS satisfies all requirements.
   2. On-Site Tests Described Under PART 5 - EXECUTION:
      a. Operational Readiness Test “ORT”
      b. Performance Acceptance Tests “PAT”.
   3. Test Format: Cause and effect
      a. Person conducting test initiates an input (cause)
      b. Specific test requirement is satisfied if the correct result (effect) occurs
   4. Procedures, Forms, and Checklists:
      a. Conduct all tests in accordance with, and documented on, ENGINEER accepted procedures, forms, and checklists.
      b. Describe each test item to be performed.
      c. Have space after each test item description for sign off by appropriate party after satisfactory completion.
   5. Required Test Documentation: Test procedures, forms, and checklists. All signed by OWNER/ENGINEER and Contractor.
   6. Conducting Tests:
      a. All special testing materials and equipment.
      b. Wherever possible, perform tests using actual process variables, equipment, and data.
      c. If it is not practical to test with real process variables, equipment, and data, provide suitable means of simulation.
      d. Define simulation techniques in test procedures
      e. For PICS Subsystems for which OWNER provides applications software, provide sufficient temporary software configuring to allow for ORT testing of these subsystems.
   7. OWNER/ENGINEER will actively participate in many of the tests.
   8. OWNER/ENGINEER reserves the right to test or retest all specified functions whether or not explicitly stated in the Test Procedures.
   9. OWNER’s/ENGINEER’s decision will be final regarding acceptability and completeness of all testing.

B. Provide field support during OWNER/Engineer testing of installed applications software

PART 5 EXECUTION

5.01 EXAMINATION

A. Equipment furnished by Supplier or any other subcontractor and installed by the ICS/Contractor, requires Supplier to observe and advise on installation to extent required to certify that equipment has been properly installed and will perform as required.

B. For equipment not provided by the ICS, but that directly interfaces with the PICS, verify the following conditions:
   1. Proper installation.
   2. Calibration and adjustment of all instrumentation and control devices.
   3. Correct control action.
   4. Switch settings.
   5. Opening and closing speeds and travel stops.
   6. Input and output signals.

5.02 INSTALLATION

A. Material and Equipment Installation:
   1. Follow manufacturer's installation instructions, unless otherwise indicated or directed by the OWNER/ENGINEER
   2. Retain a copy of the manufacturer's instructions at the project site, available for review at all times.

B. Wiring:
   1. All wiring connected to PICS components and assemblies shall be in accordance to the requirements of Division 16 and 17 of the Specifications.

5.03 FIELD QUALITY CONTROL

A. General: All requirements listed in Subsection Source Quality Control, above, also apply to this Subsection, Field Quality Control.

B. Onsite Supervision:
   1. The ICS Project Site Representative shall supervise and coordinate all onsite PICS activities.
   2. The ICS Project Site Representative shall be On-Site during total period required to complete all On-Site PICS activities.

C. Startup and Testing Team:
   1. Thoroughly check installation, termination, and adjustment for all PICS Subsystems and their components.
   2. Completed On-Site tests.
   3. Provide and conduct startup services
   4. Complete onsite training.

D. Sequence of Work: Provide individual ORTs and PATs for individual process equipment where required to support the staged construction and startup of the facility. Coordinate the construction sequencing requirements with the OWNER.

E. Specialty Equipment: For certain components or systems provided under this Section but not manufactured by the ICS, provide services of qualified manufacturer's representative during installation, start-up, testing (both ORT and PAT) and OWNER's training. For example: RTD calibrator, vibration shaker table (which may be furnished/operated by vibration sensor manufacturer representative), pressure calibrator, etc, shall be provided as required.

F. Operational Readiness Test (ORT):
   1. Prior to start of the Performance Acceptance Test "PAT", the ICS firm shall inspect, test the PICS equipment and systems, document the resulting tests performed, implement all corrective actions necessary, perform all associated re-testing, and document that the PICS is installed and ready for operation. Subsequent to the ICS documentation that the PICS is installed and ready for operation, perform jointly with the OWNER an ORT on the associated PICS equipment to demonstrate that it is fully operable as required by the Contract Documents.
   2. For PICS subsystems where the PLC application software is provided by the OWNER, provide sufficient temporary software configuring to allow testing of these subsystems.
   3. Loop/Component Inspections and Tests:
      a. Check PICS for proper installation, calibration, and adjustment on a loop-by-loop, and component-by-component basis.
      b. Develop and provide forms as required to document ORT. All forms generated shall have provisions for signature by PICS representative.
      c. Develop and provide test form hereinafter called the "Loop Status Report" to organize, track inspection, adjustment, and calibration of each loop. Loop Status Report shall include the following as a minimum:
         1) Project name
         2) Loop number
         3) Tag number for each component
         4) Checkoff/signoffs for each component:
            a) Tag/identification
            b) Installation
            c) Wiring termination
            d) Tubing termination
            e) Calibration/adjustment
         5) Checkoffs/signoffs for each loop:
            a) Panel interface termination
            b) PLC I/O interface terminations
         6) PLC I/O Signals are Operational: Received/sent, processed, adjusted
         7) Total loop operational
         8) Space for comments.
      d. Develop and provide test form hereinafter called the "Component Calibration Sheet" to organize, track inspection, adjustment, and calibration of each component (except hand switches, pilot lights, gauges, and similar items) and each PLCs I/O Module. The Component Calibration Sheet shall include the following as a minimum:
         1) Project Name
         2) Loop Number
         3) Component tag number or I/O module number
         4) Manufacturer name
         5) Model number/serial number
         6) Summary of functional requirements. For example:
            a) Indicators
            b) Transmitters/converters, input and output ranges
            c) Computing elements' functions
            d) Controllers, action (direct/reverse) and control modes (P&ID)

e) Switching elements, unit range, differential (fixed/adjustable), reset (auto/manual)
f) PLC I/O modules: input or output

7) Calibrations, for example, but not limited to:
a) Analog devices: Actual inputs and output at 0, 25, 50, 75, and 100 percent of span, rising and falling
b) Discrete Devices: Actual trip points and rest points
c) Controllers: Mode settings (P&ID)
d) PLC I/O Modules: Actual inputs or outputs of 0, 25, 50, 75, and 100 percent of span, rising and falling.

8) Space for comments

e. Maintain loop status reports, valve adjustment sheets, and component calibration sheets at the project site and make them available to the OWNER at all times.

f. These inspections and tests, inclusive of the above described forms, will be spot checked by the OWNER.

g. The ICS shall implement all corrective measures needed and perform re-test on any modified sub-system/component.

h. The Contractor shall claim and validate a thorough ORT was performed successfully and all resulting corrective action measures taken were performed successfully and re-tested successfully. Upon successful completion of the ORT, the Contractor shall submit letter notification to the OWNER stating that the ORT has been successfully completed. The letter notification shall further state that the ICS is ready to begin the Performance Acceptance Test. Submit all forms upon completion of ORT as required by the OWNER.

G. Performance Acceptance Tests “PAT”:

1. Once the ORT has been successfully completed, perform jointly with the OWNER a PAT on the associated PICS to demonstrate that it is operating as required by the Contract Documents. The PAT will employ the OWNER’s PLC application software developed for the project.

2. Minimum duration of the PAT shall be a cumulative total of fifteen (15) calendar days. The cumulative total quantity of calendar days shall be consumed in association and in synch with the overall construction sequence for the project. Any Holidays that occur during the PAT shall result in a corresponding number of days being added to the duration of the PAT. The PAT encompasses startup and testing period of the instrumentation and control system for the associated process and mechanical equipment that are controlled and monitored by the instrumentation and control system. The PAT shall be conducted using application software developed by the Engineer. The ICS shall test functions installed and the hard-wired system and the entire associated instrumentation and control system including validating the operation and monitoring and control functions of the all instruments, all control devices, all instrument and control components, control functions, alarm function, monitoring function, calibration ranges, control/alarm setpoint operations, etc. OWNER/Engineer shall test software functions. The ICS shall also test the DCS.

3. Demonstrate each required function on a paragraph-by-paragraph, loop-by-loop, and site-by-site basis based upon the operating description used by the OWNER for PLC application software development.

4. Non-loop specific tests shall be the same as previously required except that the entire installed PICS shall be tested using actual process variables and all functions demonstrated.
5. Perform local and manual tests for each loop before proceeding to remote and automatic modes
6. Where possible, verify test results using visual confirmation of process equipment and actual process variable. Unless otherwise directed, exercise and observe devices supplied by Others, as needed to verify correct signals to and from such devices and to confirm overall system functionality. Test verification by means of disconnecting wires or measuring signal levels is acceptable only where direct operation of plant equipment is not possible.
7. Make updated versions of documentation required for PAT available to the OWNER at the project site, both before and during tests.
8. Develop and provide PAT test forms that include the following, at minimum:
    a. Project name
    b. Lists the requirements of the loop
    c. Briefly describes the test
    d. Cites the expected results and the actual results
    e. Provides space for checkoff by witnesses.
9. Make one copy of all O&M manuals available to the OWNER at the site both before and during testing.
10. The ICS shall implement all corrective measures needed and perform re-test on any modified system.

5.04 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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SECTION 17200

INSTRUMENTATION AND CONTROL CABINETS AND ASSOCIATED EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Furnish, install, and put into satisfactory service the modifications to the Owner's existing Main Instrumentation/Control Panels and/or Distributed Control System Panels as specified herein and as shown on the Drawings.

B. The requirements of this Section of the Specifications applies to all of the various types of instrumentation and control cabinets/boxes as specified herein and shown on the PLANS.

1.02 RELATED REQUIREMENTS

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the CONTRACTOR's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR's Work.

C. Related work as called for on the PLANS, as specified herein or in other Sections of the Specifications.

1.03 SUBMITTALS

A. Submit the following in accordance with the Section 01300 and 01730 of the Specifications:
   1. Shop drawings and product data.
   2. Operation and maintenance manuals.

1.04 TOOLS AND SPARE PARTS

A. Furnish the following spare parts in conformance with the specifications:
   1. One set (minimum 3) of fuses for each type and size used.
   2. One set (minimum 3) of Circuit Breaker Overcurrent Protection Devices for each type and size used.
   3. Ten (10) terminal blocks of each color and type used.
   4. One (1) control relay assembly of each type used, complete with all accessories.
   5. One (1) timing relay assembly of each type used, complete with all accessories.
   6. One (1) process variable transmitter Indicator controller, complete with all accessories.
   7. 25 percent spare push-buttons, selector switches, indication light assemblies for each type used (minimum of 1 per type).

8. 50 percent of spare lenses and lamps for each type, color and size used (minimum of 1 per type)

PART 2 PRODUCTS

2.01 INSTRUMENT AND CONTROL WIRING

A. General wiring and control power and alarm wiring:
   1. Extra flexible, #14 AWG, tin plated copper conductor 600V insulation, SIS wire manufactured by General Cable Company, The Okonite Company or approved equal. The pigmentation of the wire insulation shall conform to the color table listed below:

Wiring Function	Wire Jacket Color
Wiring for 120 volts A.C. control/status signal wiring. This does not apply to control/status signal wiring that are scheduled for interface with Programmable Logic Controller (PLC) and Alarm wiring	Red
Wiring for 120 volts A.C. control to relay coils (L1 & L2 terminals or H&N terminals) that are not generated from a PLC Discrete Output point (DO)	Gray
Wiring for 120 volts A.C. power to instrumentation and control devices that are not generated from a PLC Discrete Output point (DO)	Gray
Alarm wiring	Yellow
Wiring for 24 volts D.C. power supply wiring	Blue = Positive Brown = Negative
Wiring for 120 volts A.C. light fixtures, convenience receptacles and exhaust fans	Red = Line (Phase A) Black = Line (Phase B) Blue = Line (Phase C) White = Neutral
Wiring to Discrete Input PLC modules	Violet
Wiring to Discrete Output PLC modules	Pink
Ground wires	Green

B. 4-20 Milliamp Signal wiring:
   1. Number of Pairs: One
   2. Wire Size: #16 AWG
   3. Type of Conductors: Stranded copper conductors, twisted

4. Individual Conductor Insulation: PVC
5. Individual Conductor Insulation Color: Positive (+) is Black, Negative (-) is White
6. Drain Wire: Tinned copper
7. Overall Shield: Aluminum-mylar shield.
8. Overall Jacket: PVC
9. Overall Jack Color: Black.
10. Manufacturer: Samuel Moore and Company, Dekoron Division, Cat. No. 1852 or approved equal.

2.02 INSTRUMENT AND CONTROL CABINETS EQUIPMENT

A. Overcurrent Protection
   1. General: Individually protect each device as shown on the PLANS. Furnish and install protection using the devices shown on the PLANS and as specified hereinafter.
   2. 120 volts AC circuit Protective Devices:
      a. Ratings: 120 volts A. C., one pole. Size per NEC. Note: Use 20 ampere rating for control panel convenience receptacles.
      b. Certifications: U. L. Listed.
      c. Mounting: Din Rail Mountable
      d. Indications: Visible trip indicator
      e. Manufacturer: Allen-Bradley Series 1492-SP, Phoenix Contact, or approved equal.
   3. 24 volts DC circuit breakers:
      a. Ratings: 24 volts DC, one pole. Size per NEC.
      b. Certifications: U. L. Listed
      c. Mounting: DIN rail mountable
      d. Indications: Visible trip indicator
      e. Manufacturer: Allen-Bradley Series 1492-GH, Phoenix Contact, or approved equal.

B. Pushbuttons, Selector Switches, Pilot Lights
   1. General Requirements:
      a. Rating: NEMA 4X corrosion resistant, Heavy Duty
      b. Size: NEMA Style full size 30-millimeter (30mm),
      c. Contacts: 10 ampere minimum at 120 volts A.C. Provide number of contacts to satisfy the requirements of the PLANS.
      d. Legend Plate: Furnish and install per manufacturer's standard with inscription as shown on the PLANS.
      e. Manufacturer: Allen Bradley Bulletin 800H, or approved equal.
   2. Additional Requirements for Selector Switch/ Pushbuttons:
      a. Operator Color: Furnish and install the color as shown on the PLANS, black otherwise.
      b. Selector Switch Action Type: Maintained action, unless shown otherwise on the PLANS.
      c. Pushbutton Action Type: Momentary action, unless shown otherwise on the PLANS.
   3. Additional Requirements for Pilot Lights:
      a. Type: Transformer Type Light Emitting Diode (LED),
      b. Style: Push-to-test
      c. Lens Color: Furnish and install the colors as shown on the PLANS.

4. Additional requirements for Emergency Stop/Trip Push-Button Stations:
    a. Action Type: Push-Pull maintained
    b. Operator Type: Mushroom head
    c. Operator Color: Red, unless shown otherwise on the PLANS
    d. Padlock attachment: Furnish and install as manufactured by Allen-Bradley Bulletin Push-Pull Padlocking Attachment Catalog Number 800T-N314, or approved equal.
    e. Padlock: Furnish and install padlock with 0.25 inch diameter padlock shackle. Coordinate the shackle diameter with the padlock attachment. Furnish and install padlock as manufactured by Master Lock, or approved equal.

C. Control Relays: Control relays shall be furnished and installed as required by the schematic diagrams. All control relays shall be Type I relays unless specifically noted otherwise on the PLANS or as specified hereinafter.
1. Type I Control Relays:
    a. Type: 300 volt “Ice-Cube” type
    b. Rated: Pilot-Duty C300 rated
    c. Coil Voltage: 120 volts A.C.
    d. Contact Rating: 10 ampere at 120 volts A.C.
    e. Number and Configuration of Contacts: three Form-C Contacts (3PDT)
    f. Position Indication: Integral LED pilot light
    g. Manual Operator: Integral to relay
    h. Mounting: DIN rail mountable socket
    i. Accessories: Socket, Retaining Clip, Relay Manufacturer’s Transient Voltage Suppression Module.
    j. Manufacturer: “Allen-Bradley” Bulletin 700-HA33A1-3-4, complete with 700-HN205 socket, 700-AV3R surge suppressor, and 700-HN157 retainer clip, or approved equal.
    k. The following are additional requirements associated with Type I control relays:
        1) Of the maximum of three Form-C type contacts that are available from each Type I Control Relay, one of the Form-C contacts shall be dedicated as “spare” and wired to terminal blocks for future use by the OWNER. Multiple Type I relay coils shall not be connected in parallel in order to develop additional contacts as may be shown on the PLANS. Should the PLANS require greater than two contacts from a control relay, then furnish and install a Type II Control Relay in lieu of a Type I Control Relay.
2. Type II Control Relays:
    a. Type: 600 volt Heavy-Duty industrial type
    b. Rated: NEMA rated
    c. Coil Voltage: 120 volts A.C.
    d. Contact Rating: 10 ampere at 120 volts A.C.
    e. Number and Configuration of Contacts: 4 Normally Open and 4 Normally Closed, at minimum. Furnish and install one additional normally open (N.O.) and one additional normally closed (N.C.) contact, over that required by the PLANS. Field configurable type contacts.
    f. Position Indication: Visual mechanical unlatch-latch indicator
    g. Mounting: Provide universal mounting strip/plate for backpanel mounting.
    h. Accessories: Relay Manufacturer’s Transient Voltage Suppression Module

i. Manufacturer: Allen Bradley Bulletin 700-P, or approved equal.

3. Type III Control Relays:
   a. Type: 300 volt “Ice-Cube” type
   b. Coil Voltage: 24 volts D.C. (nominal voltage)
   c. Position Indication: Integral LED pilot light
   d. Manual Operator: Integral to relay
   e. Contact Rating: 10 ampere at 120 volts A.C.
   f. Number and Configuration of Contacts: four (4) Form-C Contacts (4PDT)
   g. Mounting: DIN rail mountable socket
   h. Accessories: LED indicator light, Push-to-Test button, socket and retaining clip
   i. Miscellaneous: Used only where specifically noted on the DRAWINGS.
   j. Manufacturer: "Allen-Bradley", catalog 700-HF34Z24-3-4, complete with relay socket base catalog number 700-HN139 and relay retaining clip 700-HN140, or approved equal.

D. Timing Relays:
   1. Type: Solid state, multi-time, and multi-function type relay. Both timing ranges and timing modes shall be field selectable. Each relay shall be capable of the following timing modes: On Delay, Off Delay, One Shot, Repeat Cycle, and Interval
   2. Coil Voltage: 120 volts A. C.
   3. Contact Rating: 10 amps, continuous, at 120 VAC.
   4. Number and Configuration of Contacts: 2 Form C (2PDT)
   5. Mounting: DIN rail mountable socket
   6. Accessories: Socket, DIN rail mountable
   7. Manufacturer: Square D Class 9050 model No. JCK70 complete with Type NR61 Socket, or approved equal.

E. Terminal Blocks:
   1. Type: Single Layer
   2. Rating: 600 volts A.C./D.C., 55 ampere
   3. Wire Range: No. 22 through No. 8 AWG
   4. Material: Nylon or polypropylene
   5. Quantity per Foot: 37
   6. Terminal Block Colors: Provide terminal blocks with the colors as follows:

Terminal Block Function	Terminal Block Color
Terminal Blocks for 120 volts A.C. control/status/alarm/ PLC monitoring	Red
Terminal Blocks for 120 volts A.C. power wiring	Black
Terminal Blocks for Ground wiring	Green
Terminal Blocks for 24 volts D.C. wiring	White

   7. Manufacturer: Allen-Bradley Bulletin 1492-HM3, Phoenix Contact, or approved equal.
   8. Accessories:
      a. All terminal blocks shall be provided with manufacturer’s standard snap-in marker card and holder as manufactured by Allen-Bradley Bulletin No.

1492-SMN81, Phoenix Contact, or approved equal. Provide manufacturer's standard typed adhesive terminal block tag for each terminal block.

b. Provide manufacturer's standard insulating jumpers, DIN rail, barriers, end anchors, etc., and all related mounting hardware as required for a complete and functional installation. Coordinate models of terminal block accessories such as end anchors, jumpers, DIN rail, etc., with the terminal blocks as specified hereinafter for a complete and functional installation.

F. Flexible spiral wrapping: Size as required. Provide as manufactured by Electrovert Spiraband, or approved equal.

G. Plastic Wireway: Size as required. Also refer to the PLANS. Provide white color unless specified otherwise. Provide as manufactured by Panduit, or approved equal.

2.03 IDENTIFICATION

A. Instrument and Control Devices Identification
   1. General:
      a. The device designations shall agree with those shown on the PLANS.
      b. Each device shall be provided with permanent type identifying nameplate.
      c. Nameplates:
         1) Type: 3-ply, 1/8" thick, rigid thermoset phenolic resin laminated cellulose paper base engraving stock per ASTM D-709, Type I. Nameplates shall be ASTM Grade ES-1, ES-2, or ES-3 as applicable for the face and lettering colors specified hereinafter. Flexible or acrylic tags will be not be accepted.
         2) Color: White-Black-White, unless shown otherwise on the PLANS.
         3) Lettering: 1/4 inch height minimum unless shown otherwise on the PLANS, engraved through the face layer to the melamine middle layer.
         4) Accessories: Provide holes for mechanical fastening.
   2. Devices located on the face of, on the back, or inside of instrument control cabinets/panels:
      a. Devices which penetrate the door shall be provided with two nameplates, one located on face of the door and one located on the rear of the door.
      b. Nameplates located on the panels/cabinets face shall be secured with two Type 316-Stainless Steel screws.
   3. Field mounted control and instrument devices:
      a. Securely hang nameplates from each instrument/control device by a flexible stainless steel snap-on type hanger/key-chain cord (neatly drill a hole through the top of the identification nameplate for this purpose).

B. Wire Tag:
   1. Rating: Flame-Retardant,
   2. Style: Heavy-Duty Industrial Grade
   3. Type: Heat Shrinkable type.
   4. Character Height: 1/8 inch.
   5. Maximum Length: 2 inches.
   6. Text Type: Typed with indelible marking process. Handwritten shall not be accepted.

7. Color: Yellow. Exception: Use White for 120 volts A.C. power circuits to instrument/devices, and branch circuit lighting and convenience receptacle circuits.
8. Manufacturer: “Raychem type Heavy-Duty Industrial Grade ShrinkMark Heat-Shrinkable Marking Sleeves”, or approved equal. Utilize "Raychem" Portable-Marking-System” complete with wire tag cartridges, or approved equal.

2.04 MISCELLANEOUS

A. Corrosion Resistant and Moisture Repelling Electrical Coating/Spray:
1. Color: Clear. Coordinate spray color with the Owner. Furnish and install the color requested by the Owner at No Additional Cost to the Owner.
2. Type: Corrosion resistant and moisture repellant fast drying spray coating sealant
3. Manufacturer: “3M” 1601 Clear-Color Fast Drying Sealer and Insulator, or approved equal.

PART 3 EXECUTION

3.01 STORAGE

A. Storage: Refer to Section 17100.

3.02 PANEL ASSEMBLY

A. All panel internal wiring, device installation, tagging, etc. shall be accomplished by the ICS at the site. All wiring shall be connected as shown on PLANS. Additional requirements are as described below.

B. Termination and Routing of Wiring:
1. Prior to being connected to any instrument or switch, all incoming wiring shall be terminated to terminal blocks located on an interior panel.
2. Each PLC shall have dedicated terminal strips for each analog input, analog output, discrete input, and discrete output module, with each point from each module wired out and terminated to terminal blocks i.e., all input/output module points, where shown active or as spare, shall be wired out and terminated to terminal blocks. Spare points shall be treated the same as any other active point and shall follow the same format described under wiring/terminal block tagging scheme/strategy/method. Also refer to and comply with the requirements of the PLANS.
3. Provide separate terminal blocks for power wiring, from control/discrete signal wiring, and from analog/instrument wiring. Additionally, segregate and isolate analog/instrument terminal strips from control/discrete signal wiring terminal strips from power wiring terminal strips.
4. Terminate shield wire of each shielded cable to a terminal point (block) on the terminal strip (i.e., treat as current carrying conductor), with each shield terminated to a dedicated terminal block. Extend No. 14 AWG insulated green ground wire from each shielded cable shield termination terminal point to the isolated main ground bar of the cabinet (shield/drain wire ground).

5. Wire spare contacts of each device (i.e., control relays, timing relays, selector switches, indicating/controlling instruments/devices, etc.) to terminal blocks for future use by the OWNER.
6. Tag each terminal block. All tags must be typed and neatly attached to the marking surface.
7. Tag each terminal strip/string of terminal blocks with nameplates as previously specified.
8. Terminal blocks shall have the colors previously specified according to the function of the terminal block.
9. Utilize manufacturer's standard terminal block insulated side jumpers for making connections between adjacent terminal blocks.
10. Route all wiring from a device (instrument, relay contact, push button, etc.) through the terminal block to the other device (instrument, relay contact, push button, etc.) rather than directly from one device to the other.
11. All wiring shall be neatly bundled, laced together and routed as required throughout the cabinet. Enclose wiring routed against the back panel in plastic wireways where possible. Otherwise, group where possible and wrap with flexible wire wrapping or waxed twine. Wiring routed on doors shall be routed such that the door can be fully opened without stressing the wiring.
12. Wire entering the cabinets shall enter through the floor, the side and/or the top of the cabinets via conduits with bushings or hubs.
13. Also refer to and comply with the requirements of the PLANS.

C. Wire Tagging
   1. Tag each wire at each end.
   2. Tag each wire in multi-conductor cable in addition to the overall cable.
   3. Heat shrink all wire tags.
   4. Wire Tag Content:
      a. Wiring of each equipment (such as Distribution Service Pump, Pump Discharge Control Valve, etc.) within the facility must be tagged different from any other equipment
      b. Terminal block terminal designation must be included in the wire tag.
      c. To represent all of the text to be shown, multiple wire tags may be needed at each end of the wire. Provide additional tags as necessary at no additional cost to the OWNER.
      d. Provide per Section 16200 "Wiring (600 volt and Below), subsection 3.03 "Wire Tagging Methodology".

D. After all wiring connections have been made, the Contractor shall apply the Corrosion Resistant and Moisture Repelling Electrical Coating/Spray to all wiring connections. Coordinate application with the Owner. The extent of spray application is further clarified as follows:
   1. Spray shall be applied for all terminations of the following types of connections at a minimum:
      a. termination points, terminals, terminal blocks, ground bar, neutral bar/bus,
      b. lugs of circuit breakers, buses, doors, etc.
      c. exposed/stripped ends of each conductor, etc.
      d. bolt-on connections, split-bolt connections, ring lugs, etc.
      e. compression connectors, connector blocks, etc.
      f. all other connection types not listed above

2. Spray shall be applied for all terminations at the following types of equipment at a minimum:
    a. Local and main control panels, field instruments, junction boxes, field control stations, control relays, signal isolators, selector switches, pushbuttons, etc.,
    b. Panelboards, transformers, motor control centers, manual motor starters, contactors, light switches, light fixtures, etc.
    c. Motor termination enclosures, valve actuators, cathodic protection system, package control panels of process equipment, etc.
    d. Security system devices, cameras, roadway gate operators, etc.
    e. Convenience receptacles, scada receptacles, etc.
    f. All other types of equipment not listed above.

3.03 FIELD INSTALLATION

A. All wiring shall be connected as shown on PLANS and all systems shall be thoroughly checked out.

B. Install all equipment in accordance with the drawings and instructions furnished by the manufacturer.

C. Inspect each new instrument, control component, etc., before installation. Replace deficient items.

D. Touch-up and restore damaged surfaces to factory finish to match existing.

3.04 INSTALLATION REPORT

A. After installation, the manufacturer's representatives shall inspect the installation and prepare a report or reports to include the following:
    1. A list of all deficiencies found.
    2. Recommend corrective action for all deficiencies.
    3. Certification that the item or system is properly installed, except as noted.

3.05 FIELD CALIBRATION AND TESTING

A. Calibrate instruments and prepare calibration reports. All calibration shall be performed by factory-trained technical personnel. Calibration shall be witnessed by OWNER.

B. The complete system shall be tested by an experienced factory-trained technical person. All system tests shall be witnessed by OWNER.

C. Perform the following tests using simulated inputs:
    1. Check the overall system and each subsystem to see that they function as specified based on simulated inputs at each sensor and at each set of field contacts monitored. This check shall include the testing of all automatic functions, sounding of alarms, shutdowns, etc.
    2. Check the overall accuracy of each new and modified instrument loop to ensure that it is within acceptable tolerance.

D. If defects are found under simulated conditions, make corrections and retest.

E. After start-up, test the complete system under actual conditions to determine that all specified functions can be performed.

F. After completion of testing, submit a System Test Report. This report shall include:
   1. Certification that the system is operating correctly and within tolerances.
   2. Listing of calculated tolerances for each new and modified instrument loop.

3.06 OPERATION AND MAINTENANCE TRAINING

A. Start-up Training: Provide required instruction to the OWNER's personnel during start-up period.

B. Special Training School: Provide services of a factory-trained instructor or instructors for a period of not less than one (1) working day for the purpose of instructing the OWNER's personnel in the correct operating and maintenance procedures for all the instrument and hard-wired control system components installed in this project. The date of this school shall be scheduled with the OWNER, but will be after the entire instrument and control system is in operation.

3.07 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

SECTION 17380

FIELD INSTRUMENTATION AND SENSING DEVICES

PART 1 GENERAL

1.01 SUMMARY

A. The work performed under this Section consists of furnishing, installing, calibrating and placing into satisfactory service the following field mounted devices/elements as shown on the PLANS:
   1. Intelligent Temperature Measuring Transmitters

B. Instrument Type Code:
   1. An Instrument Type Code identifies each instrument and consists of an alphabetical character(s) followed by three numeral characters.
      a. Example Instrument Type Code: “A123”.
   2. The Type Code serves as a means to reference each instrument in the specifications.

1.02 RELATED REQUIREMENTS

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the CONTRACTOR’s responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR’s Work.

1.03 SUBMITTALS

A. Submit the following in accordance with the Section 01300 and 01730 of the Specifications and in accordance to Section 17100 of the Specifications:
   1. Shop Drawings and product data.
   2. Submit wiring schematics for all equipment.
   3. Submit listing of all field instruments tag numbers for verification by OWNER.
   4. Test Reports: Completed and certified factory and field calibration data sheets for instruments and devices that require set-up and calibration.
      a. Include factory calibration for each instrument with stated accuracy.
   5. Operation and maintenance manuals.
      a. Include all completed and certified test reports in manuals.
         1) Refer to specifications herein for transmitter ambient and process fluid temperature ranges to be used for basis of accuracy analysis.
      b. Include all programming setpoints and parameters for programmable instrument indicating transmitters/controllers.

1.04 QUALITY ASSURANCE

A. Examine the complete set of Contact Documents and verify that the instruments are compatible with the installed conditions including:

1. Process conditions: Fluids, pressures, temperatures, flows, materials, etc.
2. Physical conditions:
    a. Installation and mounting requirements.
    b. Location within the process.
    c. Accessories: Verify that all required accessories are provided and are compatible with the process conditions and physical installation.

B. Notify the ENGINEER if any installation condition does not meet the instrument manufacturer's recommendations or specifications.

C. Material Compatibility:
1. Material selections of instrument components noted in this section provide a basis for the minimum material compatibility requirements.
2. Instrument component material selections shall be subject to additional restrictions and compliance with recommendations of instrument manufacturers for the intended service.
3. Provide instrument component materials in compliance with specific process fluid temperature, pressure, chemical compatibility, and other process fluid parameters.

1.05 TOOLS AND SPARE PARTS

A. Furnish the following spare Field Instrumentation and Sensing Devices in conformance with the Specifications:
1. One set of complete Type T203 Intelligent Temperature Measuring Transmitter, furnished complete with accessories specified.

PART 2 PRODUCTS

2.01 GENERAL

A. Refer to applicable requirements in other specification sections and the PLANS regarding additional product requirements for instruments and sensing devices to be provided for this Work.

2.02 INTELLIGENT TEMPERATURE MEASURING TRANSMITTERS

A. T203: Intelligent Temperature Measuring Transmitters with Integral Temperature Element for Ambient Temperature Measurement
1. The Temperature Transmitters shall measure and convert the temperature from a temperature sensor element to a 4-20 mAdc electrical and digital output that is Linear with the actual temperature of fluid being measured.
2. The Temperature Transmitters shall have the following features:
    a. Communication Signal: Two-wire 4-20 mAdc (loop powered) proportional and Linear with the actual measured temperature of the process variable.
    b. Factory Pre-calibrated Temperature Span: As listed in the "Instrument List".
        1) Note: Where span is not listed in the "Instrument List", default span shall be 0 to +200 degrees Fahrenheit.

c. Accuracy: 0.1 percent of calibrated span of the 4-20 mA analog output, includes effects of linearity, hysteresis, and repeatability referred to temperature input.
d. Nonlinearity: 0.1 percent of calibrated span of the 4-20 mA analog output relative to a 100 ohm platinum RTD. Alpha shall equal 0.00385 standard curve for nominal range. Based on 4:1 minimum improvement on nonlinearity otherwise.
e. Thermal Effect:
    1) Zero Shift: 0.02 percent of calibrated span of the 4-20 mA analog.
    2) Span Shift: 0.02 percent of calibrated span of the 4-20 mA analog.
f. Circuitry: Epoxy Encapsulated. Analog Circuitry with sealed potentiometers.
g. Power Supply:
    1) Working Voltage: 8.5 to 35 VDC.
    2) Supply Voltage Effect: Less than 0.001 percent of calibrated span of the 4-20 mA analog output per Volt.
h. Loop Considerations:
    1) Loop Resistance Load Effect: Less than 0.002 percent of calibrated span of the 4-20 mA analog output per 300 Ohms.
    2) Maximum Loop resistance: (Voltage supply -8.5 Voltage) / 20 mA.
i. RFI Immunity:
    1) Rated Class 3-C: 0.25 percent of calibrated span of the 4-20 mA analog output per SAMA PMC 33.1-1987-2abc.
j. Frequency Response: Output -3dB at 3 Hertz Input.
k. Temperature range:
    1) Ambient: -13 to +185 degrees Fahrenheit.
    2) Storage: -85 to +257 degrees Fahrenheit.
l. Humidity:
    1) 0 to 95 percent noncondensing.
m. Input: 100 ohm platinum RTD, Alpha equals 0.00385.
n. Output:
    1) Signal Range: 4 to 20 mA DC.
    2) Absolute Limit: 2 to 29 mA.
    3) Open RTD Indication: Output greater than 22 mA.
o. Calibration Range Adjustability:
    1) Zero: 25 percent of normal span.
    2) Span: 25 percent of normal span.

3. Factory Furnished Accessories:
    a. Connection Head: Screw top.
    b. Sensor:
        1) Type: RTD spring loaded fitting with 4-inch sheath.
        2) Sensor Assembly Connection: Mounted directly to Transmitter.
    c. Thermowell:
        1) Mounting: Integral to sensor.
        2) Length: 4 inches.
        3) Thermowell Assembly Connection: Mounted directly to Transmitter.
4. Mounting Hardware: Manufacturer’s Type 316 Stainless Steel mounting bracket suitable for mounting transmitter on 2-inch pipe stand, support channel, wall/panel or other surface as shown on PLANS. Refer to the PLANS for additional requirements.

A. Each Intelligent Temperature Measuring Transmitter along with the associated Temperature Sensing Element and System shall be as manufactured by DEVAR, Inc., Series SM812-EC Temperature Transmitters with Type CHA Connection Head, Type RTDSF-4 Series Sensor Element per Factory Drawing 515315-0003, Type W4 Thermowell and specified manufacturer furnished accessories, or Engineer approved equal.

PART 3 EXECUTION

3.01 STORAGE AND HANDLING

A. The field instrumentation and control devices shall be handled carefully to prevent damage. Units shall be stored in a weatherproof structure prior to installation.

3.02 INSTALLATION

A. General: The following apply to all products in this Section:
   1. Unless otherwise specified, all instrument mounting channels, pipes, pipe caps, etc. shall be Type 316 stainless steel; also, all hardware connecting and securing the mounting hardware and instruments such as nuts, bolts, instrument tubing Cush-A-Clamp Assembly Pipe/Tube Clamp etc. shall be Type 316 Stainless Steel.
   2. All field mounted sensor/control/instrument devices shall be permanently identified. The device designations shall agree with those shown on the PLANS. Each device shall be provided with permanent type identifying nameplate. Nameplates, unless otherwise specified, shall be shaped as a circle and shall be constructed of 3-ply “White-Black-White” laminated phenolic material having engraved letters approximately 1/4 inch high extending through the white face into the black layer. Securely hang nameplates from each sensor/control/instrument device by a flexible stainless steel snap-on type hanger/key-chain cord (neatly drill a hole through the top of the identification nameplate for this purpose).
   3. Nameplates:
      a. Type: 3-ply, 1/8” thick, rigid thermoset phenolic resin laminated cellulose paper base engraving stock per ASTM D-709, Type I. Nameplates shall be ASTM Grade ES-1, ES-2, or ES-3 as applicable for the face and lettering colors specified hereinafter. Flexible or acrylic tags will be not be accepted.
      b. Color: White-Black-White
      c. Lettering: 1/4 inch height, minimum, engraved through the face layer to the melamine middle layer.
      d. Accessories: Provide holes for mechanical fastening.
      e. Attachment Means: Securely hang nameplates from each sensor/control/instrument device by a flexible stainless steel snap-on type hanger/key-chain cord (neatly drill a hole through the top of the identification nameplate for this purpose).
      f. Each nameplate inscription shall at minimum consist of the Instrument Tag, then followed by an Instrument Description as listed in the Instrument List or other description source per the PLANS and/or Specifications, then the unit of measure, and then the INFOR Position Tag. The unit of measure shall be placed in parentheses. Not all instruments may have an

INFOR Position Tag, refer to the Instrument List and PLANS and/or Specifications. If the INFOR Position Tag is not noted or is noted as “N/A”, then an INFOR Position Tag is not to be included on the nameplate inscription. Locate and orient nameplate so that it is easily and readily identifiable by Owner.

4. Submit listing of all field instruments tag numbers for verification by OWNER.
5. Install, set, adjust and test all devices per the requirements of Section 17100 of the Specifications. Also, setpoint values shall be reviewed by and coordinated with the OWNER/ENGINEER.
6. The instruments specified under this Section of the Specifications shall be installed and calibrated to match its respective system and per the requirements of the Contract Documents and as recommended by the manufacturers.
7. Verify ranges with Owner and Engineer prior to ordering instruments.
8. Refer to Specification Section 16150 “Raceways, Fittings, and Supports” for instrument support channel system requirements.
9. Make all final connections and terminations per the instrument manufacturers’ recommendations.
10. Unit and Range of each instrument from the Instrument shall as required and shall be clearly noted on the instrument Submittals. Instrument ranges shall be confirmed via the submittal process with the Owner prior to ordering any of the Field Instrumentation and Sensing Devices specified under this Section of the Specifications. Select instruments within approved manufacturer series that provide the greatest level of accuracy within the span of required measurement.
11. Submit comprehensive calibration sheets to the OWNER indicating “as found” and “final settings”. Submit a typical (blank) field calibration sheets/forms to the OWNER for review and comment prior to utilizing the same for recording calibration parameters. Include final field calibration settings in the Operation and Maintenance Manuals.
12. Coordinate the installation with all trades to ensure that the mechanical system has all necessary appurtenances including weld-o-lets, valves, etc. for proper installation of instruments.
13. Provide manufacturer’s services to perform start-up and calibration/verification.
14. Verify factory calibration of all instruments in accordance with the manufacturer’s instructions. Return factory calibrated devices to the factory if they do not meet the field verification requirements for calibration.

B. Radar Level Element and Indicating/Transmitters
   1. Position and orient instrument beam as required for optimal and most accurate level measurements for well/tank/container application and to reduce interference from side walls of wells/tanks/containers.
   2. Program instrument to filter out interference of side walls inside wells/tanks/containers to maximize level accuracy of instrument.
   3. Configure the instrument via the instrument manufacturer local instrument buttons/keys and as required via the instrument manufacturer configuration software from a computer or other digital device for instrument start-up and measurement optimization.

C. The provided information does not necessarily include all required instruments. Provide all instruments identified in the Contract Documents. Instruments may be shown on the PLANS, in the Specifications or both.

3.03 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

SECTION 17501

AIR QUALITY MONITORING SYSTEM

GENERAL

1.01 SUMMARY

A. Furnish and install gas sensors, transmitters, and centrally located control panel as shown on PLANS and as specified herein with integral auxiliary fail alarm relay. Gas sensors to be capable of mounting remotely, up to approximately 75 LF away from centrally located Gas Control Panel. Gas Control Panel to be capable of outputting individual alarms to SCADA system.

B. At a minimum, the gases that must be monitored/detected are as follows: Oxygen (O_2), Methane (CH_4), Carbon Monoxide (CO), and Hydrogen Sulfide (H_2S).

1.02 RELATED REQUIREMENTS

A. PLANS show general arrangement, location, and basic dimensions.

B. Related work as called for on PLANS or specified in this or other TECHNICAL SPECIFICATION Sections.

1.03 REFERENCES

A. American Society for Testing and Materials International (ASTM)

B. Local and State Building Codes

C. National Electrical Manufacturers Association (NEMA)

1.04 SUBMITTALS

A. Furnish the following in accordance with Specifications Section 01300, “Submittals” and Section 01730, “Operation and Maintenance Data”.
   1. Shop Drawings and Product Data.
   2. Wiring Schematics for all equipment.
   3. Manufacturer’s installation instructions for all components and accessories.
   4. Catalog bulletins or comparable illustrations and data sheets for all components and accessories. Material submitted must describe and illustrate materials of construction, dimensions, ratings, and functions of each item.
   5. Completed and certified factory and field calibration data sheets for instruments and devices that require set-up and calibration.

B. Furnish in accordance with Specification Section 01730, “Operation and Maintenance Manuals”:
   1. Operating and maintenance instructions and parts lists. A list of recommended spare parts other than those specified. Predicted life of parts subject to wear.

C. Installation Report:
   1. Furnish copies of certified report prepared by Manufacturer’s technical representative certifying satisfactory installation, operation, and in service placement of units.

1.05 SPARE PARTS

A. Furnish the following spare Field Instrumentation and Sensing Devices in conformation with the Specifications:
   1. One (1) complete set of all equipment and appurtenances needed for testing and calibration of each type of gas analyzer and indicating transmitter as specified in the PLANS and herein.
   2. One (1) set of all special tools required.
   3. One (1) complete set of gas sensor replacements.

1.06 QUALITY ASSURANCE

A. Comply with the requirements specified in Specification Section 01400, “Quality Control Services”.

B. Equipment specified shall be the product of a single manufacturer.

C. The Contractor shall obtain the sensors, transmitters, and control panel as a complete and integrated package to insure proper coordination and compatibility and operation of the system. Contractor responsible for all details necessary to properly install, adjust, and place in operation complete working system.

D. Equipment specified shall be manufacturer’s standard cataloged product and modified to provide compliance with the drawings, specifications and the service conditions specified and indicated.

E. Manufacturer of specified equipment shall have a minimum of ten (10) operating installations with equipment specified and in the same service as specified operating for not less than ten (10) years.

F. If equipment proposed is heavier or taller, different width, or the air sampling arrangement is different than specified and indicated; provide all structural, architectural, mechanical, and electrical revisions at no additional cost to the Owner.

G. Provide fabrication in compliance with all applicable ASTM standards or equivalent international standards.

H. Manufacturer must be capable of providing on-site service with factory-trained personnel.

1.07 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver to site undamaged.

B. Storage: Store above ground on platforms, skids, or other supports, and protect from corrosion and mechanical damage in accordance with manufacturer’s recommendations and instruction. Protect electrical components from condensation.

C. Handling: Handle unit to prevent damage during unloading and installation. Follow manufacturer’s instructions on lifting and setting.

PRODUCTS

2.01 SYSTEM DESCRIPTION

A. The air quality monitoring system shall constantly monitor the Lower Wet Well Channel for the following gases: Oxygen (O_2), Carbon Monoxide (CO), Methane (CH_4), and

Hydrogen Sulfide (H_2S). Once any of the specified gases reaches the concentration specified herein, the gas sensor/transmitter shall trigger the alarm. The alarm shall be relayed to the gas control panel and trigger a visual alarm, both at the sensor and control panel, in addition to outputting the individual distinguishable alarms to SCADA.

B. Gas sensors shall be Electrochemical, Catalytic, or Infrared (IR) in nature as specified herein.

C. The Contractor shall coordinate the details, dimensions, and operating requirements of the air quality monitoring system, in order to effect an arrangement that will provide a safe and efficient means for monitoring the air quality of the Lower Wet Well Channel. To this end, the actual dimensions and arrangements as shown may vary, if required, to improve operations.

2.02 MANUFACTURERS

A. ENMET
1. Model LC-4 Four-Channel Gas Detection Controller
2. Model EX-6120 Methane Sensor/Transmitter
3. Model EX-6175 Carbon Monoxide Sensor/Transmitter
4. Model EX-6175 Oxygen Sensor/Transmitter
5. Model EX-6175 Hydrogen Sulfide Sensor/Transmitter

B. Honeywell
1. HA71 Gas Detection Controller
2. XNX Universal Transmitter w/ Methane Sensor
3. XNX Universal Transmitter w/ Carbon Monoxide Sensor
4. XNX Universal Transmitter w/ Oxygen Sensor
5. XNX Universal Transmitter w/ Hydrogen Sulfide Sensor

C. MSA
1. X5000 Gas Monitor
   a. Sensor 1: 16 Oxygen
   b. Sensor 2: 22 Hydrogen Sulfide 0-100 PPM
2. X5000 Gas Monitor
   a. 10 Carbon Monoxide 0-100 PPM
   b. AA Combustible IR 5% Methane
3. JB5000 Junction Box

D. Sensidyne
1. SensAlert Plus Point Gas Detector (4)
   a. Methane/Combustibles Sensor
   b. Carbon Monoxide Sensor
   c. Oxygen Sensor
   d. Hydrogen Sulfide Sensor
2. SensAlert Four Channel Gas Detection Controller

E. Or Owner/Engineer approved equal

2.03 EQUIPMENT

A. Gas Sensors
1. Furnish gas sensor/analyzer and indicating/transmitter for the detection and monitoring of Oxygen (O_2), Carbon Monoxide (CO), Methane (CH_4) and Hydrogen Sulfide (H_2S) gas.
2. The sensor units can be remotely located from a monitor/readout unit by up to 75 feet.

3. Sensors shall be provided with all necessary cables, line extenders, hardware, etc., to meet the requirements of the PLANS. Coordinate the length of cables required with the requirements of the PLANS and provide one continuous length from the sensor to the transmitter/controller as shown on the PLANS.
4. Operating Ranges and Sensor Type
    a. Oxygen, O2
        1) 25% by Volume
        2) Electrochemical
    b. Carbon Monoxide, CO
        1) 0-100 PPM
        2) Electrochemical
    c. Hydrogen Sulfide, H2S
        1) 0-100 PPM
        2) Electrochemical
    d. Methane, CH4
        1) 100% Lower Explosive Limit (LEL)
        2) Catalytic or Infrared (IR)
5. Housing/Assembly
    a. Housed in a 316 stainless steel housing with flame arrestor to meet explosion-proof requirements.
    b. Sensing element assembly shall consist of explosion proof junction box and Electrochemical/IR/Catalytic gas sensor.
    c. Enclosure shall be designed to meet IP65/NEMA 4X requirements.
6. Electrochemical sensors shall not require the periodic addition of reagents.

B. Indicators/Transmitters
1. General Performance
    a. Four-wire loop
    b. Shall operate from power supplies of 12-30 VDC, 200 mA maximum
    c. Response Time (T90): 10 seconds
    d. Measurement Resolution: 1% LEL
    e. Electronic Linearity: ±0.5%
    f. Zero Drift: Less than 2% full scale per month
    g. Span Drift: Less than 3% per month
    h. Operating Temperature: -20° to +60°C
    i. Humidity Range: 0 to 95% RH non-condensing
    j. Operating Pressure: Atmospheric ±10%
2. Transmitter Enclosure
    a. Housed in explosion proof aluminum enclosure with window to meet IP65/NEMA 4X requirements.
    b. Magnetic Controls shall be operable through the enclosure window without removing cover.
    c. Transmitter and sensor shall meet explosion-proof specifications for Class 1, Division 1, Group B, C, & D locations.
3. Local Indicator
    a. LCD local indicator (integral to gas Indicator/Transmitter)
4. Operator Local Controls
    a. Provide operational interface for service personnel
    b. Four (4) minimum controls to allow calibration functions, lock the 4-20mAdc output, or manually vary the output signal for test procedures.
5. Electronic Module
    a. The gas transmitter module shall be designed as a plug-in unit that can be easily removed for service without disconnecting field wiring.
    b. Modules shall be interchangeable, allowing immediate exchange of transmitter electronics in the event of a fault in a module.
6. Transmitter Output
    a. 4-20 mA dc insulated analog output linear to gas concentration.

b. Capable of driving external loads up to 1000 ohms with a standard 24 VDC.
c. Electrically isolated from ground and from all other internal circuits that are not isolated from ground.
d. Output isolation shall be provided by the transmitter.

7. Alarm Relays
   a. Three (3) SPDT Relays, each 5A at 230 VAC resistive, HIGH ALARM, LOW ALARM, and SYSTEM FAILURE
   b. Relay Coil programmable either normally energized or normally de-energized.

C. Gas Monitor Control Panel
1. Furnish Gas Detection/Monitoring Control Panel for monitoring, at a minimum, 4-mA gas sensor/transmitters or similar devices. Control Panel to receive input from all four remote gas sensors/transmitters and indicate alarm levels for each individual sensor/transmitter.
2. Gas Detection Control Panel to be furnished with the following manufacturer accessories:
   a. Strobe Light, Red (12-72 VDC)
   b. Battery Backup: An internal battery backup shall provide a minimum of 12 hours operation for up to four sensors under no alarm conditions.
3. General
   a. Operating Temperature: -10° to +50°C
   b. Storage Temperature: -20° to +50°C
   c. Humidity Range: 0 to 95% R.H. Non-condensing
   d. Input Voltage: 18-28V DC, or 100-240V AC 50/60 Hz
   e. Environmental Rating: IP65
4. User Interface
   a. LES Backlit Liquid Crystal Display (LCD)
   b. Four (4) button multifunction keypad
   c. LED Indications consists of at least three (3) different visual alarms: Red, Yellow, and Green.
5. Power Supply
   a. Fuse 1 (AC Input): T1.0A
   b. Fuse 2 (24VDC Input): T500mA
6. Input Modules
   a. Minimum of four (4) channels to coincide with, at minimum, four (4) sensor/transmitter inputs (Oxygen, Carbon Monoxide, Methane, and Hydrogen Sulfide).
   b. Minimum of four (4) Signal Inputs
      1) 4-20 mA Current Loop from 24 V source
      2) 4-20mA Current Loop sink to 0 V
      3) 3-Wire Pellistor Systems
   c. Minimum of four (4) Analogue Outputs
      1) 4-20mA Current source proportional to detected signal.
      2) 4-20mA Current sink proportional to detected signal.
      3) 1-5V Voltage output proportional to detected signal.
      4) Minimum of ten (10) Relays
         a) 1 relay assigned to alarm level 1, channel 1, 2, 3, & 4.
         b) 1 relay assigned to alarm level 2, channel 1, 2, 3, & 4.
         c) 1 relay assigned to common alarm level 3.
         d) 1 relay assigned to fault condition.
         e) Single Pole Changeover Contacts (voltage free)
         f) 5A 240V AC

2.04 OPERATION

A. Control Panel must indicate, at a minimum, sensor gas reading, sensor missing, sensor end of life, calibration fault and calibration in process.

B. The monitor shall have a reset connector and button for resetting latched alarms.

C. Monitor set-up and start-up shall not require that the enclosure be opened during this process.

D. The monitor shall be factory calibrated and ready for out-of-box use. Only a gas check is required to ensure proper operation.

E. Start-up Training: Provide required instruction to the OWNER's personnel during start-up period.

EXECUTION

3.01 INSTALLATION

A. Follow manufacturer's and supplier's instructions and approved shop drawings for installation of equipment.

B. Provide hardware, wire, conduit, and accessories as required for a complete installation.

3.02 FIELD TESTING

A. Testing and Placing in Service
   1. All final adjustments of equipment, controls, and instruments to be performed with assistance from technicians representing equipment manufacturer.
   2. Coordinate start-up with other phases of construction for project. Instruct operating personnel concerning operating and maintenance procedures.

B. Manufacturer's Services
   a. Provide services of factory-trained representatives of the manufacturer to correct defective Work during the one-year correction period.
   b. Testing, checkout, and start-up of equipment shall be performed under the technical direction of the manufacturer's factory-trained representative.
   c. A manufacturer's factory-trained representative shall check and approve the installation before operation.
   d. The representative shall revisit the job site as often as necessary until all deficiencies are corrected.
   e. Manufacturer shall submit written documentation verifying all testing and that equipment is acceptable for complete operation.
   f. Demonstrate, instruct, and train OWNER maintenance and operation personnel on sequence of operations, general facility operation, and facility maintenance procedures. Provide a minimum of four (4) hours of training exclusive of travel covering complete operations and maintenance. Start-up and training assistance shall be by the manufacturer's technical service agent.

C. Field testing will not be conducted without an accepted procedure, calibration certificates for all testing equipment, and a completed and signed pre-testing check list.

D. Make all adjustments necessary to place equipment in specified working order at time of above tests.

3.03 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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SECTION 17600

DISTRIBUTED CONTROL SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, equipment, and incidentals required, and shall install complete, ready for operation, and test the distributed control system, hereinafter termed the System as shown on the PLANS and as specified.

B. The Instrument and Control System Contractor (ICS) shall provide equipment, materials, software, calibrations, training, startup assistance and system check-out, and other services that are required to successfully interface and interconnect the System and associated equipment that are specified or designated in PLANS or provisions of these specifications for the purpose of providing a fully integrated and functional control system as specified.

C. The ICS shall be responsible for furnishing and installing the Communication System for the Distributed Control System “DCS” shown on the PLANS (installation and testing of the Ethernet cable and validation of communication system), and as specified hereinafter.

D. The ICS shall be responsible for all modifications to the Owner’s existing distributed control system as also shown on the PLANS.

E. Refer to the PLC Input/Output Schedule and wiring schematics on the PLANS and other subsections of this Specification Section for requirements related to the PLC Input/Output.

1.02 DISTRIBUTED CONTROL SYSTEM DESCRIPTION

A. General:
   1. The Distributed Control System (DCS) as shown on the PLANS and specified herein, includes, but is not limited to, the following:
      a. Programmable Logic Controllers Subsystem (PLCs),
      b. Communication System Application and System Software,.
      c. PLC networking/data communications over existing and proposed Ethernet TCP/IP network as well as Modbus Plus network
      d. Interface with Power Monitoring Units, Protective Relays, and other devices as shown on the PLANS.
      e. Interface with process/mechanical equipment having packaged control systems as shown on the PLANS.

1.03 RELATED SPECIFICATIONS

A. Refer to Section 17100.

B. This Section covers work related to the Distributed Control System DCS and its Subsystems. Note that this Section does not stand-alone. Many key technical definitions, functional requirements, training, submittals, etc. requirements for the DCS are given in Section 17100 “Process Instrumentation and Control Systems (PICS)”.

1.04 DISTRIBUTED CONTROL SYSTEM (DCS) SUBMITTALS

A. General: Submit the following in accordance with the Section 01300 of the Specifications.

B. Hardware:
   1. Shop drawings, product data, bill of materials
   2. Control system architecture block diagram,
   3. Wiring diagrams
   4. Spare parts listing.

C. Ethernet System Copper Cable Testing Submittal: Where Ethernet copper cables are required to be installed, provide a complete set of cable test results for the testing required under subsection Ethernet System Copper Cable – Source Quality Control”, this Section of the Specifications. Format and quantity of reports shall be per the requirements of Section 01300 of the Contract Specifications Provide the OWNER with a typewritten results of all tests, including a description of the equipment tested, the date and time of day tested, test values, results. Test reports shall be signed by the ICS representative

D. Operations and Maintenance O&M Manuals:
   1. Hardware: As minimum, provide the following:
      a. Final approved versions of all shop drawing submittals.
      b. Component Manufacturers’ O&M Manuals including manuals to cover installation, operation, maintenance, troubleshooting, and calibration.
      c. List of spare parts and expendables provided and list of spare parts recommended.

E. Additional submittals as required by Specifications Section 17100, Section 01300 and Section 01730 of the Contract Specifications.

F. Refer to the requirements of Specifications Section 17100.

1.05 SPARE PARTS

A. Provide the following spare parts at minimum for each applicable component that has been furnished on this project (if the component is not furnished for the project, then the spare part of that same component is not required):
   1. Provide the following SPARE equipment, complete with all accessories:
      a. Two (2) PLC processor units (CPU Modules)
      b. PLC power supply units: Ten Percent (minimum of 2) of the number required
      c. PLC RIO Head module: Ten Percent (minimum of 2) of the number shown on the PLANS
      d. PLC RIO Drop Module: Ten Percent (minimum of 2) of the number shown on the PLANS

e. PLC I/O Module (AI, AO, DI, DO): Ten Percent (minimum of 2) of the number of each type used.
f. PLC rack: One (1) of each type used.
g. PLC rack extender module, terminator, and cabling: Ten Percent (minimum of 2) of the number shown on the PLANS.
h. Local Area Network (LAN) system component (converter, modem, transceiver, etc.): Ten percent (minimum of 2) of each type provided
i. Ethernet NOE module: Ten Percent (minimum of 2) of the number shown on the PLANS.
j. One (1) ethernet switch complete will all modules for each type used
k. One (1) spare OIU complete with all accessories.
l. All spare parts shall be of the same manufacturer, model, and software revision as the installed component, and shall be provide complete with all accessories.

PART 2 PRODUCTS

2.01 GENERAL

A. Refer to Section 17100.

B. General Requirements:
1. Power source parameters:
   a. 120 volts A.C., plus or minus 10 percent, 60 Hertz
   b. Regulators and power supplies required for compliance with the above shall be provided.
2. Materials and equipment used shall be U.L. approved wherever such approved equipment and materials are available.
3. All components and interconnecting wiring shall be provided as required to satisfy the functional and operational requirements of this Specification.
4. All equipment to be installed in a control panel or on a rack, including switches, etc., shall be tagged according to the guidelines outlined in Section 17200 “Instrumentation and Control Cabinets and Associated Equipment”, of these Specifications.
5. Unless otherwise specified, tag each outlet face plate with white Label with black lettering of minimum height ¼” where label is TTP Continuous polyester thermal transfer label as manufactured by Tyco, or approved equal, with ribbon and printer by label manufacturer.
6. Communication Cables: Provide all cables for interconnection between all components of the DCS inside the and/or in duct/conduit banks, as applicable. These cables shall include cables to the various PLCs I/O racks, power supplies, central processing units, patch panels, ethernet switches, computers, etc. All cables shall be tagged per Section 17200 “Instrumentation and Control Cabinets and Associated Equipment”.
7. All equipment cabling, including copper Ethernet cable, all patch cords, etc., shall be tagged according to the guidelines and tagging labeling system outlined in Section 17200 “Instrumentation and Control Cabinets and Associated Equipment”, of these Specifications. For tagging of cables with manufacturer pre-connected cable ends, e.g. patch cords, power cords, etc., furnish and install SP self-laminating polyester labels (minimum 2” long along length of cable) with thermal transfer printable, low profile translucent polyester

film with a permanent acrylic adhesive as manufactured by Tyco, or approved equal, with respective printer and ribbon type by label manufacturer. Tag all S.O. type power cords with the tag of the equipment served.

2.02 PROGRAMMABLE LOGIC CONTROLLERS (PLCS)

A. General:
   1. Provide all hardware and software features required to make the PLCs totally operational.
   2. The PLCs shall include, but not be limited to, the equipment components called for on the PLANS and in these specifications. Capacities and/or quantities shown are minimum. Provide additional capacity or units as necessary to meet the functional requirements.
   3. Availability:
      a. Subsystem Availability Calculation: The Subsystem availability (A) for the PLC's is defined as average of the individual PLC availabilities (Ai) times the nonspecific availability (NA). That is, A = NA*(Al*A2*A3 ... *An)/n, where n is the number of PLC's.
      b. Availability Requirements: The PLC's availability shall be at least 99 percent.
      c. Component and Backup Definitions: For purposes of the availability calculations, each PLC, each PLC power supply, its process I/O, and data highway interface is considered to be an individual component. There are no backup components.
   4. Communications:
      a. Failure of any PLC or DCS component connected to the communications system network shall not affect the ability of the remaining components on the network to communicate with each other.
      b. Data Highway DH Link Requirements:
         1) Fast Ethernet (100BaseFX), as minimum
         2) Minimum operating distance: 10,000 feet
         3) Rate: 10/100 Mbps.
      c. The remote I/O shall be single channel, Ethernet, in a ring network topology. All remote I/O cabling and installation shall be in accordance to the Modicon M580 System Planning Guide.
      d. All copper Ethernet cables shall have a category 6A RJ-45 connector and category 6A cable. The connector end shall be the Boot type connector and preinstalled by the Ethernet patch cable manufacturer.
      e. Modbus and Modbus Plus shall be in accordance to the Square D standard for cable pin out and cable type, as well as the end devices to be interconnected. The cables shall be shielded. Refer to the Square D Modicon Hardware Reference Guide for Modbus serial cable pin out and guidelines. Furnish and install ruggedized taps and terminators were available from the manufacturer.

B. Programmable Logic Controllers (PLCs):
   1. Each programmable logic controller shall consist of central processor, process controller, power supply, memory, input/output, interconnecting cables, and optional items as specified.

2. Power Supply:
    a. Manufacturer: MODICON M580 Automation Series model number BMX CPS 3500, No Equal.
    b. Accessories: Provide screw clamp type removable terminal blocks, Modicon M580 model number BMX XTS CPS10 No Equal.
3. Central Processor:
    a. Memory: 65535 Kbytes, at minimum
    b. Ports: 1 mini B Universal Serial Bus (USB) port, 1 Ethernet service port, and 2 Ethernet Modbus TCP/IP port
    c. Accessories: Provide a 4 GB SD Memory Card, as manufactured by the CPU manufacturer.
    d. Manufacturer: Schneider Electric MODICON M580 BME P58 4040, No Equal.
4. Discrete Input Module DI:
    a. Manufacturer: MODICON M580 Automation Series Model number BMX DAI 1604 No Equal.
5. Discrete Output DO:
    a. Manufacturer: MODICON M580 Automation Series model number BMX DRA 0815 No Equal.
6. Analog Input Module AI:
    a. Manufacturer: MODICON M580 Automation Series model number BMX AMI 0810 No Equal. With each module, furnish and install cage clamp terminal block Modicon Model BMXFTB2800, No Equal.
7. Analog Output Modules AOs:
    a. Manufacturer: MODICON M580 Automation Series model number BMX AMO 0410 No Equal
8. Network Option Ethernet (NOE):
    a. Manufacturer: Modicon M580 Automation Series model number BME NOC 0311 Module, No Equal.
9. PLC Racks
    a. X bus and Ethernet Bus interface. Manufacturer: MODICON M580 Automation Series model number BME XBP 1200 No Equal
10. PLC Rack Extender Module:
    a. Accessories:
        1) Provide X bus extender cord, length as required per PLANS, manufactured by Extender Module manufacturer, model number BMX XBC series No Equal.
        2) Provide line terminator for extender module located at each end of the daisy chain, manufactured by the Extender Module manufacturer, model number TSXTLYEX, No Equal.
    b. Manufacturer: MODICON M580 Automation Series model number BMX XBE 1000 No Equal
11. Remote I/O Drop Module:
    a. Manufacturer: MODICON M580 Automation Series model number BME CRA 31210 No Equal.
12. Accessories:
    a. Unless specified otherwise, provide 20-way screw clamp type removable terminal block with each module, Modicon Model BMXFTB2010, no equal.

2.03 OPERATOR INTERFACE UNIT

A. General: Where required, the OIU shall effectively be a Graphical front end to the local PLC network and have complete read/write access to all registers of the local PLC network to which the OIU is connected.
   1. Communication:
      a. The OIU shall utilize Ethernet communication protocols to communicate to other peripheral devices, including PLC's, as shown in the contract drawings.
      b. The ICS shall provide the necessary cabling for communicating with the OIU for programming and configuration purposes with a personal computer. The program cabling shall be USB and minimum of 12 feet in length.
      c. The ICS shall install the necessary cabling, connectors, and termination for communication between the OIU Ethernet interface and the Ethernet network.
   2. Software:
      a. Operating System: Magelis Operating system, with latest service Pack, preinstalled by the OIU manufacturer.
      b. Software: Vijeo Designer run time software, preinstalled by the OIU manufacturer.
      c. All additional necessary software, software drivers, etc. complete will all licenses, as necessary for the proper operation of the OIU.
   3. Mounting:
      a. Mount in control panel door as shown on the Drawings. All communication ports shall be accessible with OIU installed in the control panel.
      b. Provide mounting hardware as required and install OIU according to manufacturer's instructions and requirements. Provide trim accessories to seal the gap between the OIU and control panel door.
   4. Accessories:
      a. 1 Gigabyte secure digital (SD) card, manufactured by the OIU manufacturer.
      b. All necessary cables, connectors, and terminators. Minimum cable length shall be 12 feet

B. Display Module:
   1. Type: Flat Color Active Matrix (TFT) LCD display type, with touch screen capability
   2. Size: 15" diagonal
   3. Minimum Resolution: 1024 x 768 pixels,
   4. Colors: 16,000,000 colors
   5. Power Input: 24 volts DC.
   6. Communication Ports:
      a. One (1) USB 2.0 Type A port,
      b. One (1) USB 2.0 Mini-B port
   7. Physical Environment:
      a. Ambient Air Temperature: +32° to +140° Fahrenheit
      b. Ambient Air Humidity: 10% to 90% Relative Humidity Non-condensing
      c. Free of corrosive gases
   8. Cooling Method: Natural air circulation
   9. Enclosure: NEMA 4X rated

10. Manufacturer: Schneider Electric Magelis GTU HMIDT732, No Equal.

C. Box Module:
   1. Power Input: 24 volts DC.
   2. Memory:
      a. System Card: SD Card 1 GB
      b. Internal Memory: 256 MB RAM
      c. Backup Memory: 512 kB NVRAM
   3. Communication Ports:
      a. Two (2) RJ-45 Ethernet ports,
      b. Two (2) USB 2.0 Type A ports,
      c. One (1) USB 2.0 Mini-B port,
      d. One (1) RJ-45 RS-485 serial port,
      e. One (1) 9 pin RS-232/422/485 serial port,
      f. Two (2) SD card slots [one (1) system and one (1) storage]
   4. Communication Protocol: Ethernet, Modbus TCP/IP
   5. Output Interface:
      a. One (1) 300 mW speaker output,
      b. One (1) 24 VDC auxiliary alarm output
   6. Physical Environment:
      a. Ambient Air Temperature: +32° to +140° Fahrenheit
      b. Ambient Air Humidity: 10% to 90% Relative Humidity Non-condensing
      c. Free of corrosive gases
   7. Cooling Method: Natural air circulation
   8. Manufacturer: Schneider Electric Magelis GTU HMIG3U, No Equal.

2.04 ETHERNET SWITCHES

A. General:
   1. Provide and install Ethernet switches for the Distributed Control System DCS. The ICS shall schematically design the routing and specify component make and model. The components herein shall be provided as minimum for bidding purposes. It is anticipated that Ethernet Switch technology will advance over time and the latest model of Ethernet switch having the features specified hereinafter as a minimum shall be furnished and installed.
   2. All switches shall be provided with the latest firmware from the manufacturer, where applicable. Switches to be stacked must be supplied with the same feature set, IP LAN, IOS, etc. Contractor shall furnish Ethernet switch stack cabling for switches capable of being stacked. Owner shall install Ethernet switch stack cabling.
   3. All switches shall be supplied with the manufacturer's support contract for the duration of two years starting from final completion of the project. At minimum switches manufactured by Cisco shall have the Cisco SMART NET for a minimum of two (2) years starting from final completion of the project and registered in the name of the Owner.
   4. SFP Module: Each SFP module shall be the 1000BASE-LX/LH Long Haul module with duplex LC single mode connector. All SFP modules shall be as manufactured by Cisco.
   5. Should the specified switch be designated as "End of Life" and/or discontinued by its manufacturer, contractor shall furnish and install an alternate switch, whose specifications meet or exceed the specified switch, by the same

manufacturer and that is not designated as “End of Life” and/or discontinued by the switch manufacturer.

B. Type 1 Ethernet Switches:
   1. Power Input: 120 volts A.C., 60 Hz
   2. Port Quantity and Type: 24 10/100/1000BaseTx ports, and modular uplink module to support 4 sockets for SFP 1G/10G modules. Note: The previously specified quantity of ports shall be provided even if the PLANS show lesser quantity of ports.
   3. Module: Furnish and install minimum four (4) 1000BaseLX/LH SFP modules in each switch. All SFP modules shall be the 1000BASE-LX/LH Long Haul module with duplex LC single mode connector.
   4. Manufacturer: Cisco Catalyst C9200-24T-A, or approved equal.

C. Type 2 Ethernet Switches:
   1. Provide Type 1 Ethernet Switch, this Section of the Specifications, with the exception that the copper Port Quantity shall be 48 10/100/1000BaseTx ports and that only two SFP modules are required.
   2. Furnish and install second, redundant power supply for this switch.

D. Type 3 Ethernet Switches:
   1. Provide Type 1 Ethernet Switch, this Section of the Specifications, with the exception that the SFP modules are not required.

E. Type 4 Ethernet Switches:
   1. Power Input: 120 volts A.C., 60 Hz.
   2. Port Quantity and Type: minimum 24 10/100/1000Base TX ports, 4 of which are dual purpose ports which the user may elect to use as a 10/100/10000Base TX port or as a socket for an SFP module.
   3. Module: Provide minimum one (1) 1000BaseLX/LH SFP modules with each switch. All SFP modules shall be the 1000BASE-LX/LH Long Haul module with duplex LC single mode connector.
   4. Mounting: 19-inch rack mounting with necessary kit. Refer to the PLANS.
   5. Accessories:
      a. LAN Base image
      b. For each Ethernet switch, furnish and install 120VAC Ethernet Switch power supply, model PWR-RGD-AC-DC-250 by Cisco.
   6. Manufacturer: Cisco Industrial Ethernet Switch IE-4010-4S24P.

F. Type 5 Ethernet Switches:
   1. Power Input: 24 volts D.C.
   2. Port Quantity and Type: Eight (8) 10/100 BaseTx Ethernet ports
   3. Switch shall be the unmanaged type and without power over Ethernet
   4. Operating Temperature Range: -40 degrees Celsius to 85 degrees Celsius
   5. Accessories: 2 year support contract with the manufacturer, to begin from the time that the system is commissioned and turned over to the Owner.
   6. Manufacturer: N-Tron 508TX, or approved equal

G. Type 6 Ethernet Switches:
   1. Power Input: 24 volts D.C.
   2. Port Quantity and Type: Five (5) 10/100 BaseTx Ethernet ports
   3. Switch shall be the unmanaged type and without power over Ethernet

4. Operating Temperature Range: -40 degrees Celsius to 85 degrees Celsius
5. Accessories: 2 year support contract with the manufacturer, to begin from the time that the system is commissioned and turned over to the Owner.
6. Manufacturer: N-Tron 405TX, or approved equal.

H. Type 7 Ethernet Switches:
1. Power Input: 120 volts A.C., 60 Hz
2. Port Quantity and Type: Eight (8) 10/100/1000 BaseTx Ethernet ports and 2 combo ports. Each combo port shall consist of one (1) SFP based Gigabit Ethernet port.
3. Module: Provide minimum two (2) 1000BaseLX/LH SFP modules with each switch. All SFP modules shall be the 1000BASE-LX/LH Long Haul module with duplex LC single mode connector.
4. Enclosure: Sealed, rated NEMA 4X
5. Mounting: DIN rail mount or 19-inch rack mounting with necessary kit, as applicable. Refer to the PLANS.
6. Software: LAN Base manufacturing license
7. Accessories:
   a. Provide a one year support contract with the manufacturer, to begin from the time that the system is commissioned and turned over to the OWNER
   b. For each Ethernet switch where shown to be installed on 19" rack in PLANS, furnish and install 19-inch DIN-rail adapter for rack mounting, model STK-RACK-DINRAIL= by Cisco, or approved equal.
   c. For each Ethernet switch, furnish and install 120VAC Ethernet Switch power supply, model PWR-IE170W-PC-AC= by Cisco, or approved equal.
8. Manufacturer: Cisco Industrial Ethernet IE-4000-16GT4G-E, or approved equal.

I. Accessories:
1. Furnish and install mounting brackets and hardware as required to install each Ethernet Switch according to manufacturer's instructions and requirements
2. Furnish and install all necessary cables, connectors, and terminators as required for a complete and functional installation

2.05 ETHERNET COPPER CABLES AND CONNECTORS AND HARDWARE GENERAL SPECIFICATIONS REQUIREMENTS

A. General:
1. Provide and install copper cables, connectors, patch panels, and cords for the Distributed Control System DCS. The ICS shall schematically design the routing and specify component make and model. The components herein shall be provided as minimum for bidding purposes.
2. Ethernet Copper Connectors: All copper Ethernet cables shall have a Category 6A boot type RJ-45 connector.
3. The installed Ethernet copper media system (including cable, data outlets, connectors, patch cords, patch panels, etc.) shall at minimum meet the TIA/EIA-568-C.2-10 Category 6A standards.

B. Ethernet Copper Patch Cords:
1. The Ethernet Copper Patch Cord shall be used to connect a communication device with a patch panel or Ethernet Copper Data Outlet. The Ethernet Copper Patch Cord shall also be used to connect devices directly to one

another. At minimum, furnish and install copper patch cords for all Ethernet cabling between devices or between device and patch panel within the same cabinet. Refer to PLANS for required interconnections

2. Each patch cod connector end shall be RJ-45 and shall be the Boot type connector. The connectors at each end shall be preinstalled by the Ethernet patch cord manufacturer
3. The Patch Cord shall be unshielded twisted pair and shall be rated Category 6A
4. The Ethernet copper cable outer jacket shall be Blue.

C. Patch panels:
   1. General:
      a. Approvals: Meet or exceed requirements for Category 6A per TIA/EIA-568-C.2-10
      b. In addition to the device/wire tagging requirements described in Section 17200 “Instrumentation and Control Cabinets and Associated Equipment”, provide additional labels as described below:
         1) Overall Connector Panel Labels: Printed on the patch panel case by the Manufacturer. Provide unique, alphanumeric designation
         2) Connector Panel Adapter Port Label: Each adapter port on each Connector Panel shall have clearly labeled, printed, alphanumeric designation that is unique to that Connector Panel port and printed by the patch panel manufacturer
         3) Terminate copper cabling to patch panel in accordance to TIA/EIA-568-C.2-10 standards
         4) Label each port of each patch panel. Furnish and install TTP Continuous polyester thermal transfer label as manufactured by Tyco, with ribbon and printer by label manufacturer. Label shall be white with black lettering of minimum height ¼”
      c. Each patch panel shall be accompanied with a typed patch panel schedule with the following columns: Adapter ID, Cable Side, User Side, described as follows:
         1) adapter ID: The adapter ID shall be of the form XX-YY, where:
            a) XX is the Connector Panel identifier shown by the panel manufacturer
            b) YY shall represent the adapter number within the Connector Panel
         2) Cable Side: Indicate the source of the cable. Use the “patch panel tag”-XX-YY designation where applicable
         3) User Side: Indicates the device (PLC, patch panel, etc.) connected to the adapter
         4) A Hard Copy print out of each Patch Panel Schedule shall be provided to the OWNER and ENGINEER. A soft copy on CD-R media of the patch panel schedule shall also be provided to the OWNER and ENGINEER
         5) Employ consistent and uniform application of identifier and adapter numbering assignment to Ethernet Copper cables along the entire span and route of each copper cable.
   2. Each Type 1 patch panel shall be as follows:
      a. Construction: Metal, primed and painted with manufacturer’s standard black finish.
      b. Quantity of Ports: minimum 24.

c. Miscellaneous: Color coded front port labeling.
d. Mounting: 19” rack mountable. Mount on 19” rack, with all necessary brackets and hardware. Refer to the PLANS.
e. Manufacturer: Siemon, Panduit, Hubbell, CommScope, or approved equal.
f. Mounting Bracket: Where patch panel is to be mounted to a wall or back panel, furnish and install 1U Hinged Wall-Mount 19” rack Patch Panel Mounting Bracket for wall mounting the patch panel:
1) Bracket shall be rated for minimum 8 kg (17 lbs.) weight capacity
2) Bracket shall offset patch panel from wall by a minimum distance of 5.5”.
3) Bracket shall allow for wall or back panel mounting a patch panel while providing hinged access to the back of the patch panel to facilitate installation of Ethernet connectors and Ethernet cable termination.
4) Bracket shall have mounting holes spaced 16” apart
5) Bracket shall be painted steel hardware, minimum 14 gauge thickness, mounted with 316 stainless steel screws.

3. Each Type 2 patch panel shall be as follows:
a. Construction: Plastic, fully enclosed type,
b. Quantity of ports: Minimum 2
c. Mounting: Surface mounted. Secure patch panel to backpanel with screws.
d. Manufacturer: “Panduit”, Model Mini-Com #CBXQ2IW-A, with “Mini-Com TX6A” UTP Coupler Module Model CJ6X88TGIW and blank cover plates, or approved equal.

4. Each Type 3 patch panel shall be as follows:
a. Construction: Plastic, fully enclosed type,
b. Quantity of ports: Minimum 12
c. Mounting: Surface mounted. Secure patch panel to backpanel with screws.
d. Manufacturer: “Panduit”, Model Mini-Com # CBXF12IW-AY, with “Mini-Com TX6A” UTP Coupler Module Model CJ6X88TGIW and blank cover plates, or approved equal.

5. Each Type 4 patch panel shall be as follows:
a. Construction: Plastic, fully enclosed type,
b. Quantity of ports: Minimum 4
c. Mounting: Surface mounted. Secure patch panel to backpanel with screws.
d. Manufacturer: “Panduit”, Model Mini-Com #CBXQ4AW-A, with “Mini-Com TX6A” UTP Coupler Module Model CJ6X88TGIW and blank cover plates, or approved equal.

D. Copper Ethernet Data Communication Cabling:
1. Copper Ethernet Communication Cabling shall be used to interconnect copper patch panels with each other, or to interconnect Ethernet data outlets to copper patch panels.
2. The copper Ethernet cabling shall be unshielded, twisted pair, rated Category 6A cabling.
3. Agency Compliance: TIA/EIA-568-C.2, TIA/EIA-568-C.2-10 Category 6A, IEEE 802.3an 10GBASE-T Ethernet, UL Listed
4. Number of Pairs: Four

5. Wire: #23 AWG Bare Copper
6. Type of Conductors: Solid copper conductors, twisted
7. Individual Conductor Insulation: Minimum 300 volt polyolefin
8. Individual Conductor Insulation Color: White/Blue Stripe, Blue, White/Orange Stripe, Orange, White/Green Stripe, Green, White/Brown Stripe, Brown
9. Overall Jacket: PVC, include ripcord
10. Overall Jacket Color: Blue
11. Manufacturer: Belden 10GX32, or approved equal.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION

A. The ICS shall furnish labor, materials, equipment, and incidentals required to install the system in accordance with specification section 17100 and 17600.

B. The ICS shall be responsible for ensuring that field wiring for power and signal circuits is correct and wired in accordance with best industry practice. Also, the ICS shall be responsible for providing all necessary system grounding to insure a satisfactory functioning installation.

3.02 ETHERNET SYSTEM COPPER CABLING- SOURCE QUALITY CONTROL

A. Copper Ethernet Cable System Testing:
   1. After installation of Copper Ethernet Cable System, ICS shall perform testing of the cable system to assure compliance of the installed system with the TIA/EIA-568-C.2-10 Category 6A requirements. Testing shall be performed for all installed copper cable systems, including used and unused links, from end-to-end, including all data outlets, connectors, patch panels, patch cords, etc
   2. Copper Ethernet Cable System Test reports shall be submitted to the engineer and owner for review and approval. The test report shall document, for each copper data link, description of the link and components therein, the testing method used, test results, and demonstrate compliance with TIA/EIA-568-C.2-10 of the link. If any installed link does not meet the TIA/EIA-568-C.2-10 Category 6A requirements, ICS shall repair/modify link to assure it is compliant with TIA/EIA-568-C.2-10 Category 6A standard at no additional cost to the owner.

3.03 TESTS (GENERAL)

A. Refer to Section 17100.

3.04 INITIAL ON-SITE SYSTEM DEMONSTRATION TESTS

A. Programmable Logic Controllers PLCs:
   1. Test all loop-specific functions and demonstrate all I/O Points.
   2. Test all non-loop-specific functions including, but not limited to, the following:
      a. Failure Mode and Backup Procedures: Power failure, auto restart, retentive outputs.
   3. Refer to Section 17100 for additional test requirements.

3.05 OPERATIONAL READINESS TEST (ORT) AND PERFORMANCE ACCEPTANCE TESTS (PAT)

A. Refer to Section 17100.

3.06 MEASUREMENT AND PAYMENT

A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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