# CITY OF AUSTIN
# PUBLIC WORKS DEPARTMENT

## PROJECT MANUAL
## Bid Set

## VOLUME 1 of 3

# South Austin Regional WWTP Thickener Improvements Project

**C.I.P. PROJECT NUMBER: 3333.016**
**I.F.B. PROJECT NUMBER: 6100 CLMC558**


CITY OF AUSTIN
Public Works Department
PO Box 1088
Austin, TX 78767

Documents Prepared By:
CDM Smith Inc.
TBPE Firm Registration No. F-3043
12357-A Riata Trace Pkwy Ste. 210
Austin, Texas 78727


**July 25, 2016**

It is the policy of the City of Austin to involve certified Minority Owned Business Enterprises (MBEs) and Women Owned Business Enterprises (WBEs) in City Contracting. MBE and WBE goals for this solicitation are contained in Volume 3, MWBE Participation for Construction Projects.

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**Document Number** **Title**

**VOLUME 1**

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**VOL. 3 10/09/00 MBE/WBE Procurement Program Package**


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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 sealed written Bids for furnishing all labor, materials, equipment, supervision, and incidentals, and for performing all Work required for the following Project:

South Austin Regional Wastewater Treatment Plant Thickener Improvements Project

Located at: 1017 Fallwell Lane Del Valle, TX 78617

CIP ID# 3333.016 IFB# 6100 CLMC558

The Work consists of the rehabilitation of the four gravity thickeners, which includes the following: replacing thickener mechanisms and scum collection system; reconstructing effluent boxes; replacing existing stairs and doors; constructing new scum boxes and installing scum pump systems; and recoating of thickener launder troughs. The Work also consists of the following: replacing thickened sludge pump piping; rehabilitating the existing electrical room (new roof and doors); sludge holding tank improvements (new hatches); blending tank improvements (new railings and stairs); installing two new bioscrubber odor control systems; civil site work and yard piping; and improving site lighting.

Bid Documents may be obtained at One Texas Center, 505 Barton Springs Road, Ste. 1045-B, Austin, TX 78704. Copies will be available in CD format at no cost.

At the time Bid Documents are obtained, Bidder must provide a working e-mail address, so that they will receive any addenda or clarification issued by the Owner.

Sealed Bids will be received at the Capital Contracting Office, One Texas Center, 505 Barton Springs Rd., Suite 1045-C, Austin, Texas 78704 and then publicly opened and read aloud in the **SUITE 1045-C**, **Congress Conference Room**.

**ALL BIDS ARE DUE PRIOR TO (Austin time)** September 8, 2016 at 9:30 AM.

**ALL COMPLIANCE PLANS ARE DUE PRIOR TO (Austin time)** September 8, 2016 at 1:30 PM.

**BIDS WILL BE OPENED AT (Austin time)** September 8, 2016 at 1:30 PM.

**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 1045-C** is the time of record and is verified with www.time.gov, the official U.S. time.

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 https://www.ci.austin.tx.us/vss/Advantage and follow the directions.

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.)

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.

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.

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

Contract Time is of the essence and all Work shall be substantially completed within eight hundred and fifty four (854) **Calendar** Days after date specified in the Notice to Proceed, in accordance with the Bid Form, Section 00300. Final completion shall be achieved within ninety (90) Calendar Days after substantial completion. Liquidated damages are $1,500 per Calendar Day for failure to substantially complete the work and $500 per Calendar Day for failure to achieve final completion within ninety (90) Calendar Days after substantial completion, in accordance with the Bid Form, Section 00300.

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).

A mandatory Pre-Bid Conference will be held on August 4, 2016 at 9:30 AM
(date) (time)

(Austin time) at 1017 Fallwell Lane, Del Valle, Texas 78617
(location)

Austin, Texas. Attendance is mandatory unless otherwise stated. Bidders must attend any mandatory Pre-Bid Conference and are encouraged to attend any non-mandatory Pre-Bid Conference to ensure their understanding of Owner's bidding and contracting requirements, particularly MBE/WBE Procurement Program requirements. If the Pre-Bid Conference is mandatory the Bidder must arrive and sign-in within fifteen (15) minutes of the scheduled start time of the meeting, otherwise the Bidder will not be allowed to submit a Bid for the project.

The persons listed below may be contacted for information regarding the Invitation for Bid. If the Bidder contacts any other City employee, including Council Members and members of Boards and Commissions, the Bidder may be found in violation of Ordinance No. 20111110-052, dated November 10, 2011, regarding Anti-Lobbying and Procurement. The text of that Ordinance may be viewed at http://www.cityofaustin.org/edims/document.cfm?id=161145.

NOTICE TO BIDDERS

The Austin Water Utility (AWU) adheres to a Tobacco-Free Workplace (TFW) policy. Tobacco use of any kind, including snuf, and e-cigarettes, are prohibited while on any AWU location. This includes buildings, garages, construction sites, treatments plants, and a 100 foot parameter from entrances and exits. Tobacco use is prohibited in vehicles parked on AWU sites. Contractors and their employees shall comply with this policy when making deliveries or providing services to any AWU location.

AUTHORIZED CONTACT PERSONS

PUBLIC WORKS PROJECT MANAGER: John Wepryk; telephone (512) 974-7010; email john.wepryk@austintexas.gov

CONTRACT COMPLIANCE REP.: Mary Lou Ochoa; telephone (512) 974-7215; email marylou.ochoa@austintexas.gov

**END**

**1. Preparation of Bid**

a. **Bid Documents.** Each Bidder must prepare its Bid in ink 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.

b. **Vendor Registration.** 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://www.ci.austin.tx.us/vss/Advantage and follow the directions.

c. **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.

d. **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.

e. **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 $13.03 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 $13.03 minimum wage required.

f. **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.

g. **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.

h. **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.)

i. **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 a copy of each Addendum will be provided to each person to whom a set of Bid Documents has been furnished. Any verbal communications will not be binding on the OWNER.

j. **Anti-Lobbying and Procurement.** Article 6, Chapter 2-7, Austin City Code, prohibits lobbying activities or representations by the Bidder between the date that the Invitation for Bid (IFB) is issued and the date of contract execution. The text of the pertinent City Ordinance may be viewed at http://www.cityofaustin.org/edims/document.cfm?id=161145.

**(1) Definitions**

(A) "Agent" means a person authorized by a bidder to act for or in place of bidder, including a person acting at the request of bidder, a person acting with the knowledge and consent of a bidder, or a person acting with any arrangement, coordination, or direction between the person and the bidder.

(B) "Authorized Contact Person" means the Project Manager listed in Section 00020, IFB, or other persons specifically identified in the IFB as the contact regarding the solicitation, or the authorized contact person's designee during the course of the no-contact period.

(C) "City Employee" means a person employed by the City.

(D) "City Official" is defined in Section 2-7-2 of the City Code.

(E) "No-Contact Period" means the period of time from the date the IFB is issued until a contract is executed. If the City withdraws the IFB or rejects all bids with the stated intention to reissue the same or a similar IFB for the same or similar project, the no-contact period continues during the time period between the withdrawal and reissue.

(F) "Response" means a bid.

(G) "Respondent" means a bidder. The term "respondent" also includes:

(i) an owner, board member, officer, employee, contractor, subsidiary, joint enterprise, partnership, agent, lobbyist, or other representative of a bidder;

(ii) a person or representative of a person that is involved in a joint venture with the bidder, or a subcontractor in connection with the bidder's bid; and

(iii) a bidder who has withdrawn a bid or who has had a bid rejected or disqualified by the City.

(H) "Representation" means a communication related to a bid to a council member, official, employee, or City representative that is intended to or that is reasonably likely to:

(i) provide information about the bid;

(ii) advance the interests of the bidder;

(iii) discredit the bid of another bidder;

(iv) encourage the City to withdraw the IFB;

(v) encourage the City to reject all of the bids;

(vi) convey a complaint about a particular bid; or

(vii) directly or indirectly ask, influence, or persuade any City official, City employee, or body 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.

(I) "Solicitation" means an opportunity to compete to conduct business with the City that requires City Council approval under City Charter Article VII Section 15 (Purchase Procedure).

(J) "City" means Owner.

**(2) Restriction on Contacts.**

(A) During a no-contact period, a bidder shall make a representation only through the authorized contact person.

(B) During the no-contact period, a bidder may not make a representation to a City official or to a City employee other than to the authorized contact person. This prohibition also applies to a vendor that makes a representation and then becomes a bidder.

(C) The prohibition of a representation during the no-contact period applies to a representation initiated by a bidder, and to a representation made in response to a communication initiated by a City official or a City employee other than the authorized contact person.

(D) If the City withdraws an IFB or rejects all bids with a stated intention to reissue the same or similar IFB for the same or similar project, the no-contact period shall expire after the ninetieth day after the date the IFB is withdrawn or all bids are rejected if the IFB has not been reissued during the ninety day period.

(E) The no-contact period shall expire when the first of the following occurs: contract is executed or solicitation is cancelled.

(F) The purchasing officer or the Capital Contracting Office Director may allow bidders to make representations to city employees or city representatives in addition to the authorized contact person for a solicitation that the purchasing officer or the Capital Contracting Office Director finds must be conducted in an expedited manner; an expedited solicitation is one conducted for reasons of health or safety under the shortest schedule possible with no extensions. The purchasing officer's or Capital Contracting Office Director's finding and additional city employees or city representatives who may be contacted must be included in the solicitation documents.

(G) Representations to an independent contractor hired by the City to conduct or assist with a solicitation will be treated as representations to a City employee.

(H) A current employee, director, officer, or member of a bidder, or a person related within the first degree of consanguinity or affinity to a current employee, director, officer or member of a bidder, is presumed to be an agent of the bidder for purposes of making a representation. This presumption is rebuttable by a preponderance of the evidence as determined by the purchasing officer or Capital Contracting Office Director.

(I) A bidder's representative is a person or entity acting on a bidder's behalf with the bidder's request and consent. For example, a bidder may email their membership list and ask members to contact council members on the bidder's behalf. The members are then acting per bidder's request and with their consent, and the members have become bidder representatives.

**(3) Permitted Representations**

(A) If City seeks additional information from bidder, the bidder shall submit the

representation in writing only to the authorized contact person. The authorized contact person will then distribute the written representation in accordance with the terms of the IFB. A bidder cannot amend or add information to a bid after the bid deadline.

(B) If bidder wishes to send a complaint to the City, the bidder shall submit the complaint in writing only to the authorized contact person. The authorized contact person will then distribute a complaint regarding the process to members of the city council or members of the City board, to the Capital Contracting Office Director, and to all bidders on the IFB. However, the Capital Contracting Office Director or purchasing officer shall not permit distribution of any complaint that promotes or disparages the qualifications of a bidder, or that amends or adds information to a bid. A determination of what constitutes promoting or disparaging the qualifications of a bidder or constitutes amending or adding information is at the Capital Contracting Office Director's or purchasing officer's sole discretion. Bid protests are not subject to this subsection. Documents related to a bid protest may not be forwarded to council under this subsection.

(C) If a bidder submits a written inquiry regarding an IFB, the authorized contact person will provide a written answer and distribute both the inquiry and answer to all bidders on the IFB.

(D) If a bidder does not receive a response from the authorized contact person, the bidder may contact the Capital Contracting Office Director or purchasing officer as appropriate.

(E) A bidder may ask a purely procedural question, for example a question regarding the time or location of an event, or where information may be obtained, of a City employee other than the authorized contact person. This provision does not permit a bidder to make suggestions or complaints about the contract process that constitute a representation to a City employee other than the authorized contact person. Notwithstanding this provision, a bidder may not ask a procedural question of a councilmember, a councilmember's aide, or of a City board member except in a meeting held under the Texas Government Code, Chapter 551 (Open Meetings Act).

(F) Article 6 of the City Code allows representations:

(i) made at a meeting convened by the authorized contact person, including meetings to evaluate bids or negotiate a contract;

(ii) required by Financial Services Department protest procedures for vendors;

(iii) made at a Financial Services Department protest hearing;

(iv) provided to the Small & Minority Business Resources Department in order to obtain compliance with Chapter 2-9A-D (the Minority-Owned and Women-Owned Business Enterprise Procurement Program);

(v) made to the City Risk Management coordinator about insurance requirements for a bid;

(vi) made in public at a meeting held under the Texas Open Meetings Act; or

(vii) made from a bidder's attorney to an attorney in the Law Department in compliance with Texas Disciplinary Rules of Professional Conduct.

(G) Communication regarding the solicitation is permitted between or among City officials or City employees acting in their official capacity.

(H) A contribution or expenditure as defined in Chapter 2-2 (Campaign Finance)

is not a representation.

**(4) Contract Voidable.**

If a contract is awarded to a bidder who has violated these Anti- Lobbying & Procurement provisions, the contract is voidable by the Owner.

**(5) Debarment.**

If a bidder has been disqualified under these provisions more than two times in a sixty month period, the purchasing officer shall debar the bidder from bidding for a period not to exceed three years, provided the bidder is given written notice and a hearing in advance of the debarment.

k. **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) 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.

(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.

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

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

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

(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.

(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.

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

(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.

(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. If the total Bid amount is $100,000 or less, Bidder has the option of providing a cashier's or certified check, made payable to City of Austin accompanied by a letter from a surety company indicating that Bidder can be bonded for the amount of the Project, or 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. If the total Bid amount exceeds $100,000, the only acceptable 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.

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 guaranty 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 timely execute the Contract, 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, read aloud, reviewed, and certified, the total

amount of the Bid, including accepted Bid alternates, will be considered the amount of the Bid. Upon request, certified Bid tabulations will be made available to the public. 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 furnished by OWNER:

(a) One copy of Bid form (Section 00300L or 00300U) completed and signed.
(b) Acknowledgment of receipt of Addenda issued in spaces provided in Bid form.
(c) Required Bid guaranty.
(d) Copy of statement of legal entity status, as applicable, including but not limited to, as applicable, Statement of Sole Proprietorship, Articles of Partnership or Incorporation and resolution, or corporate board minutes, empowering signatory to bind Bidder, attested to by an officer of Bidder. The required information is set forth in Section 00100, Paragraph 15.
(e) One copy of the Insurance Cost Form (Section 00425A), completed and signed (ROCIP projects only).
(f) One copy of the Affidavit - Prohibited Activities (Section 00440), completed and signed.
(g) One copy of the Nonresident Bidder Provisions (Section 00475), completed and signed.
(h) One copy of the Nondiscrimination Certificate (Section 00630), completed and signed.
(i) Required information indicated in Drawings or Project Manual.

Bid must be accompanied by a MBE/WBE or DBE Compliance Plan, signed by the authorized representative described above, that should be submitted separately in a second envelope furnished by OWNER, or other appropriate packaging accompanied by the furnished envelope, 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 and be placed in envelopes furnished by OWNER, or other appropriate packaging, accompanied by and attached to the OWNER furnished envelopes, sealed and clearly identified on outside as a Bid to OWNER, with Bidder's name and address, and project name. Failure to submit Bid appropriately may subject Bidder to disqualification. Bid may be mailed or delivered (in person or by Federal Express, Express Mail or other delivery service) to:

City of Austin
Capital Contracting Office
One Texas Center
505 Barton Springs Rd.
Suite 1045-C
Austin, Texas 78704

When sent by mail, Federal Express, Express Mail, or other delivery service, sealed Bid (marked as indicated above) shall be enclosed in an additional envelope, or other appropriate packaging, clearly identified on outside as a Bid to OWNER with Bidder's name and address, Project name, and Bid date and 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 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.

**9. Rejection of Bids**

A. The following **will** be cause to reject a Bid:

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

(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.

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

(4) Evidence of collusion among Bidders.

(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.

(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.

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

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

(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).

(10) Failure to submit any of the items specified above in paragraph 7, "Submission of Bid".

B. The following **may** be cause to reject a Bid:

(1) Poor performance in execution of work under a previous City of Austin contract.

(2) Failure to achieve reasonable progress on an existing City of Austin contract.

(3) Default on previous contracts or failure to execute Contract after award.

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

(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.

(6) Failure to acknowledge receipt of Addenda.

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

(8) Failure to identify a dollar amount (price) of a unit price(s) in the 00300U

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

(10) Failure to timely execute Contract after award.

(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.).

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

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

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

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

(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 Capital Contracting Office Director has the authority to settle or resolve any claim of an alleged deficiency or protest. The procedures for notifying OWNER of an alleged deficiency or filing a protest are listed below. If you fail to comply with any of these requirements, the Capital Contracting Office Director may dismiss your complaint or protest.

Prior to Bid opening: If you are a prospective Bidder and you become aware of the facts regarding what you believe is a deficiency in the solicitation process before the Bid is opened, you must notify OWNER in writing of the alleged deficiency before that date,

giving OWNER an opportunity to resolve the situation prior to the Bid opening.

After Bid opening: If you submit a Bid to OWNER and (1) you have been found non-responsive, or
(2) you believe that there has been a deficiency in the solicitation process or the award, you have the opportunity to protest the solicitation process or the recommended award as follows:

1. You must file written notice of your intent to protest within four (4) calendar days of the date that you know or should have known of the facts relating to the protest. If you do not file a written notice of intent within this time, you have waived all rights to protest the solicitation process or the award.
2. You must file your written protest within fourteen (14) calendar days of the date that you know or should have known of the facts relating to the protest unless you know of the facts before the Bid has been opened. If you know of the facts before that date, you must notify OWNER as stated above.
3. You must submit your protest in writing and must include the following information:
    a. your name, address, telephone, and email address;
    b. the solicitation number and the CIP number, if applicable;
    c. a detailed statement of the factual grounds for the protest, including copies of any relevant documents.
4. Your protest must be concise and presented logically and factually to help with OWNER's review.
5. When OWNER receives a timely written protest, the Capital Contracting Office Director will determine whether the grounds for your protest are sufficient. If the Capital Contracting Office Director decides that the grounds are sufficient, the Capital Contracting Office will schedule a protest hearing, usually within five (5) working days. If the Capital Contracting Office Director determines that your grounds are insufficient, you will be notified of that decision in writing.
6. 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 OWNER are: representatives from the department that requested the purchase, the Law Department, the Capital Contracting Office, 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.
7. A decision will usually be made within fifteen (15) calendar days after the hearing.
8. The Capital Contracting Office Director will send you a copy of the hearing decision after the appropriate City staff has reviewed the decision.
9. When a protest is filed, OWNER usually will not make an award until a decision on the protest is made. However, OWNER will not delay an award if the City Manager or the Capital Contracting Office Director determines that:
    a. OWNER urgently requires the supplies or services to be purchased, or
    b. Failure to make an award promptly will unduly delay delivery or performance.

In those instances, the Capital Contracting Office will notify you and make every effort to resolve your protest before the award.

The protest or notice of intent and the protest shall be submitted in writing to the following address:

City of Austin
Capital Contracting Office
ATTN: Capital Contracting Officer
One Texas Center
505 Barton Springs Rd.
Suite 1045-A
Austin, Texas 78704
PHONE: 512/974-7141

**11. Submission of Post Bid Information**

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:

1. One copy of Attachments A-J 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).
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.)
3. One copy of Section 00410, Statement of Bidder's Safety Experience, including required attachments, completed and signed.
4. One copy of the Title VI Assurances Appendix A (Section 00631), completed and signed.
5. One copy of Exhibit A Federal Provisions (Section 00810A, pages 1-9) completed and signed. (Federal projects only)
6. Such other information as is required to evaluate Bid or Bidder.

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

1. Letter(s) of intent between Bidder and all subcontractor(s) and all supplier(s) identified in the MBE/WBE Compliance Plan.
2. Section 00425B, VII 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.
3. Such other information as required. (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. 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 Office Director 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, Rolling Owner Controlled Insurance Program Information Section 00425B, VI Contractor Affidavit of Receipt and Provision of ROCIP Information must be accurately completed and submitted with the Bid to indicate insurance removed from 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 Statement of Bidder's Safety Experience, Section 00410, must be accurately completed and submitted with the Bid.

The Rolling Owner Controlled Insurance Program Information, Section 00425 B, VII 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 as a post bid submittal and further 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 and accompanied by sufficient documentation, which clearly indicates not only the legal name and entity status of Bidder, but also the capacity and authority of the person signing on behalf of 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.

The following samples show the entity information and signature requirements that will apply to all Bid and contract execution documents for the type of entity indicated:

1. Individual/Sole Proprietor (sample)

   The individual/sole proprietor must sign the document in his or her personal capacity or in any assumed name capacity accompanied by a copy of any assumed name certificate.

   Name of Contractor (d/b/a, if appropriate), a sole

   proprietor By: _____

   Printed Name:_____

2. Partnership/Joint Venture (sample)

   A partner/joint venturer must sign the document in his or her capacity as a partner/joint venturer and in any assumed name capacity accompanied by a copy of the assumed name certificate, if any, and a copy of the partnership or joint venture agreement, as applicable, with additional documentation, if necessary, establishing the authority of the signatory individual.

   Name of Partnership/Joint Venture, a Texas Partnership/JV, as

appropriate By: _____

Printed or Typed Name: _____

Title:_____(Partner, managing partner, venturer, managing venturer, as approp.)
Authorized Representative

3. Corporation (sample)

An authorized officer or agent of the corporation must sign the documents on behalf of the corporation in his or her capacity as the authorized representative of the corporation accompanied by a copy of a corporate resolution and minutes granting such authority with a certificate of an officer of the corporation as to the authority of the signatory to bind the CONTRACTOR signed and dated no more than one week before the date of execution of the document.

Name of Contractor, Inc. or Co., a Texas corporation, as

appropriate By: _____

Printed or Typed Name: _____

Title:_____(Officer or Agent (as appropriate)) Authorized Representative

4. Limited Liability Company (sample)

An authorized manager or member of the LLC must sign the document in his or her capacity as a manager or member accompanied by a copy of the LLC's certificate of organization and articles of organization and regulations evidencing such person's signatory authority.

Name of Contractor, L.L.C., a Texas limited liability company,

as appropriate By:_____,

Printed or Typed Name:_____

Title:_____, (Manager or Member (as appropriate)) Authorized Representative

5. Limited Partnership (sample)

The general partner of a limited partnership must execute the documents on behalf of the limited partnership, accompanied by copy of the limited partnership agreement and the certificate of limited partnership. In addition, the signatory must sign the documents in his or her capacity as an authorized officer or agent of the corporation or member or manager of the LLC, as appropriate, accompanied by a copy of the corporate or LLC documentation stipulated above.

Name of Contractor, Ltd., a Texas limited partnership, as

appropriate By: Name of General Partner (usually a

Texas corporation or an L.L.C.) By: _____

Printed or Typed Name:_____

Title:_____Officer or Agent of

Corporation or LLC Authorized Representative

**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**

(1) Definitions:

(A) "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.

(B) "Business Entity" – means any entity recognized by law through which business is conducted, including a sole proprietorship, partnership, or corporation.

(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:

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

(ii) 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,

(iii) include the City's contract identification number,

(iv) include a short description of the goods or services to be used by the City, and

(v) 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.

(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.

**End**

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The OWNER has provided geotechnical information from the central area of the South Austin Regional Wastewater Treatment Plant. This geotechnical data includes laboratory test results and logs of borings from geotechnical consultants. The Contractor shall assume that geotechnical characteristics of the soils shown in boring logs are similar to those in the Gravity Thickener area. Note that the focus area of this geotechnical data is north of the proposed site location of the Project.

The CONTRACTOR shall be familiar with the subsurface materials and conditions on the Project and shall be knowledgeable of how they will affect the Work. The following is a partial listing of sources of information available to the CONTRACTOR about subsurface materials and conditions: the geotechnical information provided by the OWNER; geologic maps, publications and reports available from the University of Texas Bureau of Economic Geology at the J.J. Pickle Research Center in Austin, Texas; subcontractors familiar with local ground conditions; and, local consulting geologists and geotechnical engineers. The CONTRACTOR may make their own subsurface investigations.

**Geotechnical Investigation Report - South Austin Regional Wastewater Treatment Plant Blower Improvement Project**, dated **September 11, 2015**, prepared by **HVJ Associates, Inc.** is attached. The requirements in the Drawings and Specifications shall be used in the event of a conflict between this report and the Drawings and Specifications.

**End**

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# GEOTECHNICAL INVESTIGATION REPORT
# SOUTH AUSTIN REGIONAL WASTEWATER TREATMENT PLANT
# BLOWER IMPROVEMENT PROJECT
# AUSTIN, TEXAS

**SUBMITTED TO**
**CAROLLO ENGINEERS, INC.**
**8911 CAPITOL OF TEXAS HIGHWAY NORTH, STE 2200**
**AUSTIN, TEXAS 78759**

**BY**
**HVJ ASSOCIATES, INC.**
**SEPTEMBER 11, 2015**

**HVJ REPORT NO. AG 13 12360**

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September 11, 2015

Mr. Jason Anderson, PE
Carollo Engineers, Inc.
8911 Capitol of Texas Highway North, Suite 2200
Austin, Texas 78759

Re: Geotechnical Data Report
South Austin Regional (SAR) Wastewater Treatment Plant – Blower Improvement Project
Austin, Texas
Owner: City of Austin
HVJ Project No. AG 13 12360

Dear Mr. Anderson:

Submitted herein is the final geotechnical data report for our geotechnical investigation for the above referenced project. The study was performed in accordance with HVJ proposal number AG 13 12360 dated October 8, 2013.

It has been a pleasure to work for you on this project and we appreciate the opportunity to be of service. Please notify us if there are questions or if we may be of further assistance.

Sincerely,

**HVJ ASSOCIATES, INC.**
Texas Firm Registration No. F-000646

STATE OF TEXAS
LEONEL RUIZ
97291
LICENSED
PROFESSIONAL ENGINEER

Leonel Ruiz, PE 9-11-2015
Project Engineer

The seal appearing on this document was authorized by Leo Ruiz, PE 97291 on September 11, 2015. Alteration of a sealed document without proper notification to the responsible engineer is an offense under the Texas Engineering Practice Act.

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# 1 INTRODUCTION

## 1.1 General

HVJ Associates, Inc. (HVJ) was retained by Carollo Engineers, Inc. to perform a geotechnical investigation for the South Austin Regional (SAR) Wastewater Treatment Plant (WWTP) – Blower Improvement Project. The proposed project at the SAR WWTP is located along Fallwell Lane, south of the Colorado River and east of the Austin Energy Sand Hill Energy Center, as shown on the Site Vicinity Map, Plate 1. The purpose of this project is to investigate the subsurface conditions for the existing blower building and provide information to aid in the design of a foundation system for a new overhead aeration line.

## 1.2 Scope of Work

HVJ's scope of work is to provide information on subsurface conditions at the WWTP site, specifically at the existing blower building and along the alignment of the proposed overhead aeration line. The primary objective of this study was accomplished by:

1. Drilling a total of two (2) borings to a depth of fifty (50) feet below existing grade to determine the subsurface stratigraphy and to obtain samples for laboratory testing.

2. Performing laboratory tests on select soil samples to determine the physical and engineering properties of the subsurface materials encountered.

Subsequent sections of this report contain descriptions of the field exploration, laboratory testing program, the general site and subsurface conditions, and limitations.

# 2 FIELD EXPLORATION

## 2.1 General

The field exploration program undertaken for the project was conducted between April 30th, 2014 and May 1st, 2014. Two (2) borings were completed to investigate subsurface conditions. The borings were drilled to a termination depth of fifty (50) feet below existing grade. Borings were advanced using a B-53 Mobile truck mounted drill rig equipped with hollow-stem and continuous flight augers as well as standard sampling equipment. Approximate boring locations are provided on the Plan of Borings, Plate 3. The final boring logs are presented on Plates 4 and 5, with a Key to Terms and Symbols used on the boring logs provided on Plates 6 and 7.

## 2.2 Sampling Methods and Field Testing

Fine grained, cohesive soils encountered were sampled using a 3-inch outer diameter thin-walled tube, which was pushed into the soil in general accordance with ASTM standard D 1587- *Thin Walled Tube Sampling of Soils*. The samples were extruded in the field and a calibrated pocket penetrometer was used to obtain an estimate of the unconfined compressive strength of the sample.

Standard Penetration Tests (SPTs) were conducted within the soil strata. The SPTs were performed in accordance with ASTM D 1586 – *Penetration Test and Split-Barrel Sampling of Soils*. This test consisted of driving a standardized 1-5/8 inch diameter split-spoon sampler into undisturbed soil with a 140-pound hammer falling 30 inches. The split-spoon sampler was first seated 6 inches to penetrate any loose cuttings, and then driven an additional 12 inches with blows from the hammer. The number of hammer blows required to drive the sampler each 6-inch increment was recorded. The penetration resistance "N-value" is defined as the number of hammer blows required to drive

the sampler the final 12 inches and was used in the field to estimate the density of granular soils or consistency of cohesive soils. In very dense or very hard material the SPT test was typically stopped after 50 blows from the hammer and the measurement was recorded as 50 blows per distance penetrated (e.g. 50 over 3 inches).

Classification and field test results for both the thin-walled tube and split-spoon samples were recorded onto field logs, which included a visual description in accordance with ASTM D 2488 – *Visual Description and Identification of Soils*. After field documentation and logging was complete, the individual soil samples were either wrapped in plastic or placed in sealed containers to prevent loss of moisture and were transported to our laboratory for further examination and testing.

Continuous rock core samples were collected within competent or intact rock. The coring method employed consisted of a wire-lined NX core barrel with an inside diameter of 2 inches and length of 5 feet. Water was used as the drilling fluid to promote coring. Percent recovery (REC) and the Rock Quality Designation (RQD) were recorded for each run. The REC value was obtained by dividing the total length of core recovered by the total length of the core run. The RQD value was obtained by dividing the total length of sound core pieces with a minimum length of 4 inches by the total length of the core run. The core samples were visually identified for rock type and features and properly documented on field logs, including the REC and RQD values. The samples were then secured in core boxes and transported to HVJ's laboratory for further examination and testing.

### 2.3 Groundwater Conditions

Groundwater was encountered in one (1) of the borings during drilling operations – Boring B-2 encountered groundwater at a depth of 46 feet below grade. Groundwater will also exist in a perched condition at the interface of the cohesionless soils of the Lower Colorado terrace deposits and the Clayshale of the Navarro Group. However, groundwater levels determined during drilling operations typically do not accurately reflect the true groundwater conditions, and therefore should only be considered as an approximation. It should also be noted that groundwater levels may fluctuate seasonally in response to rainfall and climatic conditions, and that the groundwater in the project area will be consistent with the Colorado River water level.

### 2.4 Borehole Completion

All project borings were backfilled with soil cuttings and bentonite chips upon completion of drilling to match the existing ground conditions.

## 3 LABORATORY TESTING

### 3.1 General

Soil samples transported to our laboratory were further examined and described and a preliminary soil classification was assigned to each soil sample based on ASTM D 2487 – *Classification of Soil for Engineering Purposes.*

Classification testing, which included moisture contents, Atterberg limits, and percent passing the No. 200 sieve, was subsequently conducted on select samples. In addition, unconfined compressive strength tests with wet and dry unit weight determinations were performed on select samples from the borings. All testing was performed in accordance with the relevant ASTM and TxDOT Standards as required. The results of these tests were used to confirm or modify the preliminary soil classifications.

The sampling information obtained in the field was used in conjunction with the laboratory examination and testing to generate final boring logs, provided on Plates 4 and 5. A Key to Terms

and Symbols used on the boring logs is provided on Plates 6 and 7. The laboratory test results are provided on the final borings logs, as well as tabulated in Appendix A.

### 3.2 Atterberg Limits

Select samples were tested to determine the Atterberg Limits in accordance with ASTM D 4318-10 (Tex 104E, and 105E). The Atterberg Limit test is used to classify the soil using the Unified Soil Classification System (USCS). The Atterberg Limit test consists of two parts: a liquid limit test and a plastic limit test. The liquid limit equipment setup consists of a brass cup partially filled with soil which is grooved with a specialized grooving tool, and then dropped freely from a specified height to the rubber base below at a constant rate of 2 drops per second. The liquid limit test is performed on soil that has been sieved through the No. 40 sieve and brought to a moisture content that would close the ½-inch groove within 20 to 30 blows for two consecutive tests. The moisture content of the soil is then measured and recorded as the liquid limit. The second part of the tests consists of a rolling a remolded sample between the tips of the fingers and a glass plate until transverse cracks appear at a rolled diameter of 1/8-inch. The moisture content of the rolled sample is taken and recorded as the plastic limit.

### 3.3 Percent Passing the No. 200 Sieve

Select soil samples were tested in accordance with ASTM D 1140 (Tex 111E) to determine the amount of material finer than the No. 200 sieve for use in classification. An oven dried sample of material is weighed then washed over a 75-µm (No. 200) sieve, allowing clay and other particles to be dispersed and removed from the soil. The retained material is oven dried then reweighed. The loss in mass resulting from the washing is calculated as mass percent of the original sample and is reported as the percentage of material finer than a No. 200 sieve.

### 3.4 Moisture Content

Moisture content testing was performed on select soil samples to determine the in situ state of moisture of the soil. A fresh sample was weighed before being placed in an oven with a controlled temperature of 230°F and dried back to a constant mass. Upon the drying and reweighing of the sample, the total mass of water lost was recorded. The ratio of the water loss to the dried mass is recorded as the moisture content. This test was performed in accordance with ASTM D 2216-10 (Tex 103E).

### 3.5 Unconfined Compressive Strength Testing

Select cohesive soil and rock samples were tested for unconfined compressive strength in accordance with ASTM D 2166-06 and ASTM D 7012-10. The intact specimen is placed in a loading device and is subjected to a load producing an axial strain at a rate between ½% and 2% per minute. The load is applied until failure occurs at the maximum rate of strain. The maximum axial strain is then used to calculate the soil's unconfined compressive strength.

### 3.6 Pocket Penetrometer Testing

A calibrated spring-loaded rod (1/4-inch diameter) is pushed into soil to a penetration of 6 mm and the gauge read for unconfined compressive strength ( = twice the undrained shear strength) in tons per square foot (tsf). Penetration is limited to soils with unconfined compressive strength less than and equal to 4.5 tsf. Data are representative for soils with Plasticity Index (PI) greater than 12. Below this value, the angle of internal friction of granular particles increases strength to more than the measured value of the undrained shear strength.

# 4 SITE CHARACTERIZATION

## 4.1 General Geology

Austin, Texas is located on the boundary of the Edwards Plateau to the west and the Gulf Coastal Plains to the east and southeast. These physiographic provinces are separated by the Balcones Fault Zone (BFZ), a belt of inactive faults, which trends generally southwest to northeast through central Austin. The project site is located east of the BFZ.

According to the Geologic Map of the Austin Area (Garner, LE and Young, KP, The University of Texas at Austin, Bureau of Economic Geology, 1976), the proposed project is located within an area characterized by Lower Colorado River terrace deposits (Qlcr) underlain by Navarro Group clayshale (Kna).

The Lower Colorado River Terrace Deposits generally consist of yellow to orange brown sand, silt, clay, and/or gravel. The gravel of the terrace deposits are generally reworked limestone and chert fragments. The average thickness is 30 feet; however, it can range up to as much as 60 feet.

The Navarro Group is divided into two formations, from bottom to top: Corsicana and Kemp. The formations consist of calcareous to silty, montmorillonitic, highly over-consolidated clay and clayshale varying in color and calcium carbonate content. It is highly plastic, with high swelling potential, and very unstable. When left exposed to the air, it will slake. Thickness of the Navarro Group is approximately 470 feet thick.

According to available geologic data, there are no mapped faults within the local vicinity of the construction limits.

## 4.2 Subsurface Stratigraphy

Soil and groundwater conditions at the project area described herein are based on information obtained at the boring locations only. Significant variations at areas not explored by the project borings may require reevaluation of our findings and conclusions. Subsurface soils as encountered at the project location are discussed below.

The general subsurface conditions at the site consisted of clay and gravel of the Lower Colorado River terrace deposits (Qlcr) underlain by clay and clayshale of the Navarro Group (Kna). Six (6) inches of crushed limestone gravel was encountered at the surface of Boring B-1. Fat Clay Fill (CH) was present beneath the crushed limestone at Boring B-1 and at the surface of Boring B-2 and extended to depths of 12 to 8 feet, respectively. The fill soils were then underlain by Lean Clay (CL) with sand extending to a depth of 18 feet at Boring B-2 and 22 feet at Boring B-1. Clayey Gravel with Sand (GC) then underlaid the lean clay to a depth of 35.5 feet at Boring B-1. The lean clay was underlain by Fat Clay (CH) to a depth of 45 feet at Boring B-2. Clay shale was then encountered in Borings B-1 and B-2 at depths of 35.5 and 45 feet, respectively, and extended to the termination depth of 50 feet below existing surface.

Detailed descriptions of the materials encountered in the borings are displayed on the final boring logs presented on Plates 4 and 5. Laboratory test results for the Lower Colorado River terrace deposits and Navarro Group layers are summarized below in Tables 1 and 2.

**Table 1 – Laboratory Test Results Summary – Qlcr**

| Laboratory Test | No. of Tests | Average | Maximum | Minimum |
|---|---|---|---|---|
| % Passing No. 200 Sieve | 2 | 50 | 84 | 15 |
| Liquid Limit (%) | 1 | 36 | 36 | 36 |
| Plasticity Index (%) | 1 | 23 | 23 | 23 |
| Moisture Content (%) | 2 | 17.5% | 17.6% | 17.4% |
| Wet Unit Weight (pcf) | 1 | 129.9 | 129.9 | 129.9 |
| Dry Unit Weight (pcf) | 1 | 110.0 | 110.0 | 110.0 |
| Unconfined Compressive Strength (tsf) | 1 | 5.1 | 5.1 | 5.1 |
| Pocket Penetrometer (tsf) | 11 | 4.3 | 4.5+ | 3.0 |

**Table 2 – Laboratory Test Results Summary – Navarro Group**

| Laboratory Test | No. of Tests | Average | Maximum | Minimum |
|---|---|---|---|---|
| Moisture Content (%) | 8 | 19.9% | 22.8% | 14.3% |
| Wet Unit Weight (pcf) | 6 | 128.6 | 135.9 | 117.9 |
| Dry Unit Weight (pcf) | 6 | 108.0 | 118.9 | 97.8 |
| Unconfined Compressive Strength (tsf) | 6 | 9.7 | 17.4 | 2.4 |
| Pocket Penetrometer (tsf) | 7 | 3.9 | 4.5+ | 3.0 |

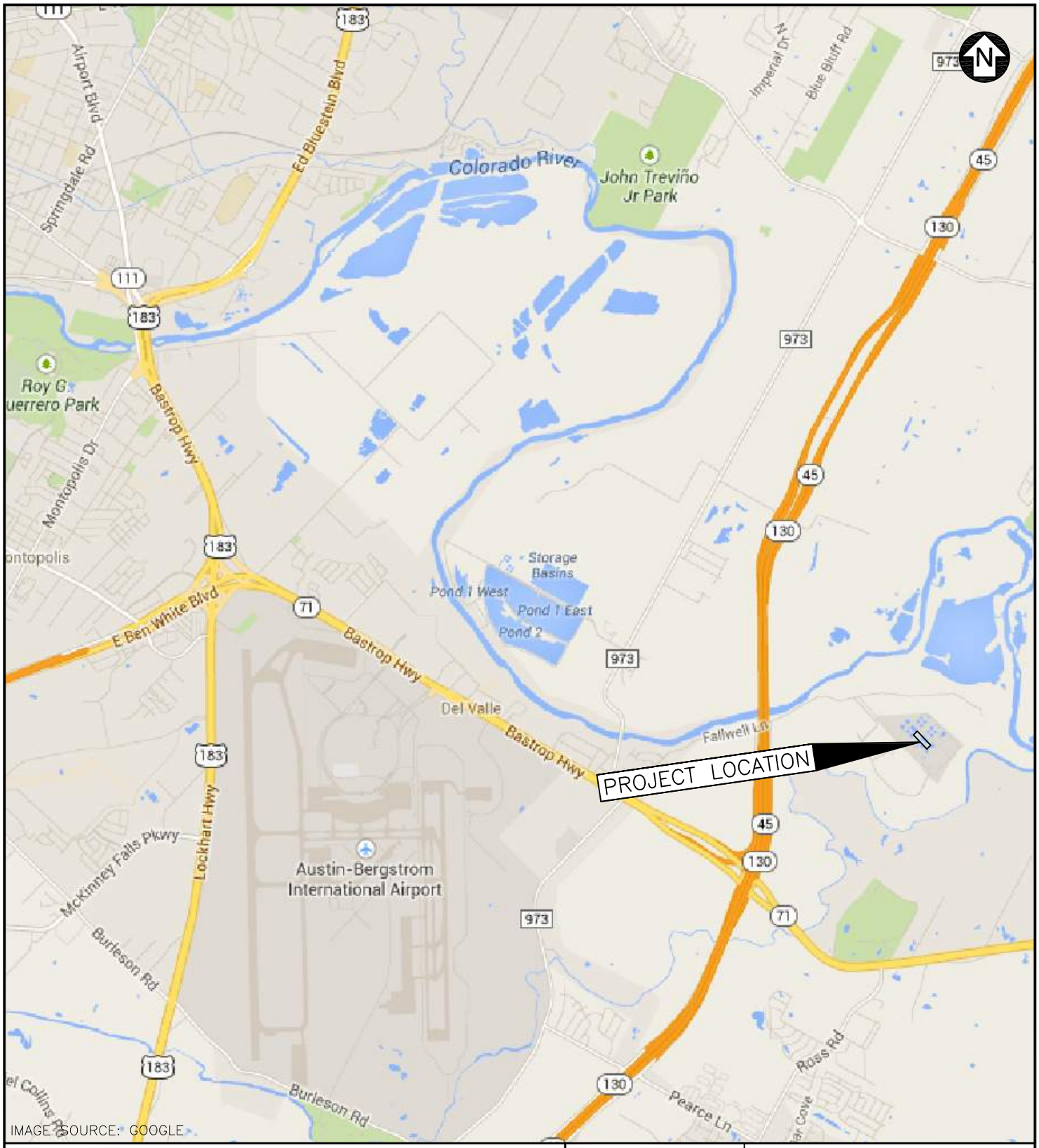
## 5 LIMITATIONS

This geotechnical data report has been issued for the exclusive use of Carollo Engineers, Inc. and the City of Austin for the South Austin Regional Wastewater Treatment Plant – Blower Improvement Project.

In performing our geotechnical investigation, HVJ Associates, Inc. has endeavored to comply with generally accepted geotechnical engineering practice common in the local area. HVJ Associates, Inc. makes no warranty, express or implied. The information contained in this report is based on data obtained from subsurface exploration and laboratory testing, as well as preliminary project design information that has been provided to us.

The exploration methods used indicate subsurface conditions only at the specific location where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Samples cannot be relied on to accurately reflect the strata variations that usually exist between sampling locations or areas where borings were not performed. Should any subsurface conditions other than those described in our test boring be encountered, HVJ Associates should be immediately notified so that further investigation and supplemental recommendations can be provided.

# ILLUSTRATIONS



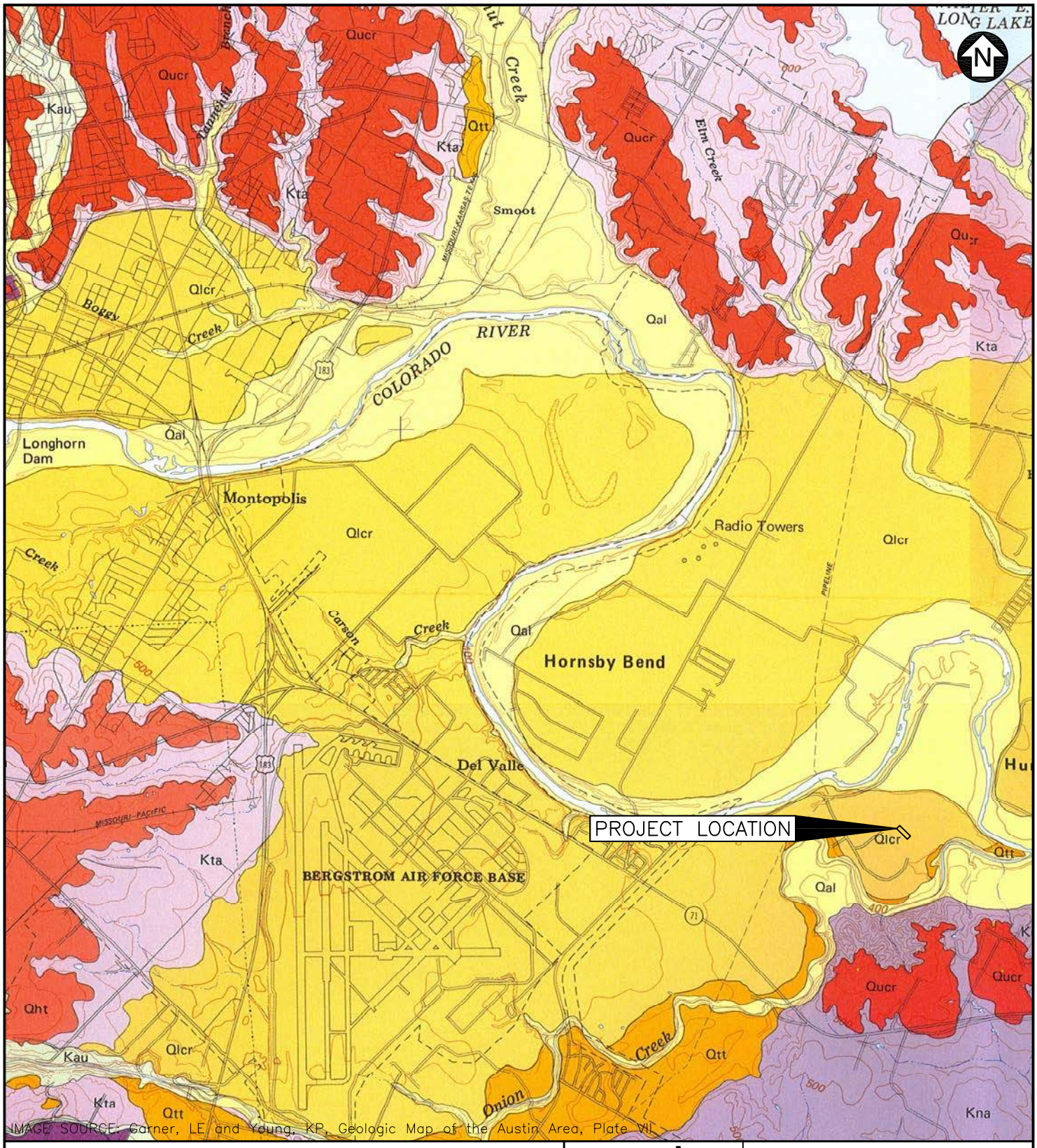
MAP LOCATION

HVJ ASSOCIATES

| | | |
|---|---|---|
| SCALE: N.T.S. | | |
| DATE: 5/8/2014 | | |
| DRAWN BY: RS | PROJ. CHK: JS | APPRV. BY: JS |

SITE VICINITY MAP
SAR WWTP BLOWER IMPROVEMENT PROJECT
AUSTIN, TEXAS

| | | |
|---|---|---|
| PROJECT NO.: AG 13 12360 | FILENAME: VIC | PLATE 1 |




LEGEND

Qal Alluvium
Qlcr Lower Colorado River Terrace Deposits
Qucr Upper Colorado River Terrace Deposits
Qtt Tributary Terrace Deposits
Qht High Terrace Deposits
Kna Navarro Clay
Kta Taylor Clay
Kau Austin Chalk

MAP LOCATION

HVJ ASSOCIATES

| SCALE: N.T.S. | | |
|---|---|---|
| DATE: 5/8/2014 | | |
| DRAWN BY: RS | PROJ. CHK: JS | APPRV. BY: JS |

GEOLOGY MAP
SAR WWTP BLOWER IMPROVEMENT PROJECT
AUSTIN, TX

| PROJECT NO.: AG 13 12360 | FILENAME: GEO | PLATE 2 |
|---|---|---|

Boring Location

MAP LOCATION

HVJ ASSOCIATES

| | | |
|---|---|---|
| SCALE: 1" = 600' | | |
| DATE: 5/8/2014 | | |
| DRAWN BY: RS | PROJ. CHK: JS | APPRV. BY: JS |

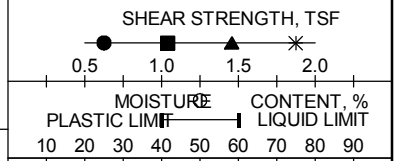
PLAN OF BORINGS
SAR WWTP BLOWER IMPROVEMENT PROJECT
AUSTIN, TEXAS

| | | |
|---|---|---|
| PROJECT NO.: AG 13 12360 | FILENAME: POB | PLATE 3 |

# LOG OF BORING

Project: SAR WWTP Blower Improvement Project | Project No.: AG13-12360
Boring No.: B-1 | Date: 4/30/2014 | Elevation: 426 feet
Groundwater during drilling: None Encountered | Northing: 10,049,918.0 | Station: --
Groundwater after drilling: None Encountered | Easting: 3,158,272.0 | Offset: --

| ELEV. DEPTH, FEET | SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA | SOIL/ROCK CLASSIFICATION | % PASSING NO. 200 SIEVE | DRY DENSITY PCF |
|---|---|---|---|---|
| 0 | PP=4.5+ tsf; PP=4.5+ tsf; PP=4.5+ tsf | 6" Crushed Limestone (Gravel Road)<br>Reddish brown and dark brown, very stiff to hard, **FAT CLAY (CH)** , with sand seams, gravel, and shell fragments. (Fill) | | |
| 5 | PP=3.0 tsf; PP=4.5 tsf | -becoming dark reddish brown below 6 feet | | |
| 10 | PP=4.5+ tsf | Reddish brown, very stiff to hard, **LEAN CLAY WITH SAND (CL)** , with shell fragments. (Lower Colorado River terrace deposits)<br>- Unconfined Compressive Strenght = 5.1 tsf | | 110 |
| 15 | PP=3.5 tsf | | 84 | |
| 20 | | Brown to tan, medium dense to dense, **CLAYEY GRAVEL WITH SAND (GC)** , with fine to coarse gravel, chert fragments, and silt. (Lower Colorado River terrace deposits) | | |
| 25 | 12-15-16 | | | |
| 30 | 16-18-20 | -a layer of gravel with sand and clay present below 28.5 feet | 15 | |




Shear Types: ● = Hand Penet. ■ = Torvane ▲ = Unconf. Comp. ✳ = UU Triaxial

See Plate 3 for boring location.

PLATE 4a

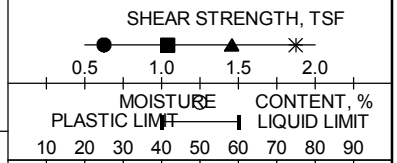
HVJ ASSOCIATES

LOG OF SOIL BORING BORINGS.GPJ HVJ.GDT 6/22/15

# LOG OF BORING

Project: SAR WWTP Blower Improvement Project
Project No.: AG13-12360
Boring No.: B-1
Date: 4/30/2014
Elevation: 426 feet
Groundwater during drilling: None Encountered
Northing: 10,049,918.0
Station: --
Groundwater after drilling: None Encountered
Easting: 3,158,272.0
Offset: --

| ELEV. DEPTH, FEET | SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA | SOIL/ROCK CLASSIFICATION | % PASSING NO. 200 SIEVE | DRY DENSITY PCF |
|---|---|---|---|---|
| 395 / 30 | 10-10-17 | Brown to tan, medium dense to dense, **CLAYEY GRAVEL WITH SAND (GC)** , with fine to coarse gravel, chert fragments, and silt. (Lower Colorado River terrace deposits) [Continued...] | | |
| 390 / 35 | PP=4.5+ tsf REC:100%, RQD:65% | Dark gray, very soft, **CLAYSHALE** , with shell fragments, calcareous particles, occasional siltstone seams and concretions, and ferrous staining. (Navarro) | | |
| | | - Unconfined Compressive Strength = 15.9 tsf | | 113 |
| 385 / 40 | REC:100%, RQD:78% | | | |
| | | - Unconfined Compressive Strength = 13.3 tsf | | 104 |
| 380 / 45 | REC:95%, RQD:95% | | | |
| | | - Unconfined Compressive Strength = 17.4 tsf | | 119 |
| 375 / 50 | | | | |
| 370 / 55 | | | | |
| 60 | | | | |




Shear Types: ● = Hand Penet. ■ = Torvane ▲ = Unconf. Comp. ✳ = UU Triaxial

See Plate 3 for boring location.

PLATE 4b

HVJ ASSOCIATES

LOG OF SOIL BORING BORINGS.GPJ HVJ.GDT 6/22/15

# LOG OF BORING

Project: SAR WWTP Blower Improvement Project | Project No.: AG13-12360
Boring No.: B-2 | Date: 5/1/2014 | Elevation: 426 feet
Groundwater during drilling: 46 feet | Northing: 10,049,711.0 | Station: --
Groundwater after drilling: --- | Easting: 3,158,528.0 | Offset: --

| ELEV. DEPTH, FEET | SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA | SOIL/ROCK CLASSIFICATION | % PASSING NO. 200 SIEVE | DRY DENSITY PCF |
|---|---|---|---|---|
| 0 (425) | PP=4.5+ tsf; PP=4.5+ tsf; PP=4.5+ tsf; PP=4.5+ tsf | Reddish brown and dark brown, hard, **FAT CLAY (CH)**, with sand seams, fine gravel, shell fragments, and calcareous particles. (Fill) | | |
| 5 (420) | | -increasing in sand content, with silt below 6 feet | | |
| 10 (415) | 6-7-7; 5-5-5 | Reddish brown and brown **LEAN CLAY WITH SAND (CL)**, with silt and shell fragments (Lower Colorado River terrace deposits) | | |
| 20 (405) | 4-8-9 | Dark reddish brown and brown, very stiff to hard, **FAT CLAY (CH)**, mottled, with calcareous particles and shell fragments. (Navarro) | 95 | |
| 25 (400) | PP=4.0 tsf | - Unconfined Compressive Strength = 4.6 tsf | | 109 |
| 30 | | | | |

SHEAR STRENGTH, TSF: ● 0.5 ■ 1.0 ▲ 1.5 ✳ 2.0

MOISTURE ○ CONTENT, %
PLASTIC LIMIT ⊢—⊣ LIQUID LIMIT
10 20 30 40 50 60 70 80 90

Shear Types: ● = Hand Penet. ■ = Torvane ▲ = Unconf. Comp. ✳ = UU Triaxial

See Plate 3 for boring location.

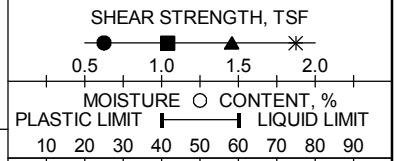
PLATE 5a

HVJ ASSOCIATES

# LOG OF BORING

Project: SAR WWTP Blower Improvement Project | Project No.: AG13-12360
Boring No.: B-2 | Date: 5/1/2014 | Elevation: 426 feet
Groundwater during drilling: 46 feet | Northing: 10,049,711.0 | Station: --
Groundwater after drilling: --- | Easting: 3,158,528.0 | Offset: --

| ELEV. DEPTH, FEET | SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA | SOIL/ROCK CLASSIFICATION | % PASSING NO. 200 SIEVE | DRY DENSITY PCF |
|---|---|---|---|---|
| 30 / 395 | PP=3.0 tsf | Reddish brown, very stiff to hard, **FAT CLAY (CH)** , mottled, with calcareous particles and shell fragments. (Navarro) [Continued...] | 91 | |
| 35 / 390 | PP=3.0 tsf | | | |
| 40 / 385 | | -gray, with silt, ferrous staining, and shell frangments below 40 feet - Unconfined Compressive Strength = 2.4 tsf | | 105 |
| 45 / 380 | PP=4.5+ tsf | Dark gray, very soft, moist, **CLAYSHALE** , with shell fragments, calcareous particles, occasional siltstone seams and concretions, and ferrous staining. (Navarro) | | |
| 50 / 375 | PP=4.5+ tsf | - Unconfined Compressive Strength = 4.5 tsf | | 98 |
| 55 / 370 | | | | |
| 60 | | | | |




Shear Types: ● = Hand Penet. ■ = Torvane ▲ = Unconf. Comp. ✳ = UU Triaxial

See Plate 3 for boring location.

PLATE 5b

HVJ ASSOCIATES

LOG OF SOIL BORING BORINGS.GPJ HVJ.GDT 6/22/15

# APPENDIX A

# LABORATORY TEST SUMMARY

**LABORATORY TEST RESULTS SUMMARY**
**SAR WWTP Blower Improvements Project**
**Project No. AG13-12360**

| Boring Number | Depth (ft) | % Passing No. 200 Sieve | Liquid Limit (%) | Plasticity Index (%) | Moisture Content (%) | Wet Unit Weight (pcf) | Dry Unit Weight (pcf) | Unconfined Compressive Strength (tsf) | Pocket Penetrometer (tsf) |
|---|---|---|---|---|---|---|---|---|---|
| B-1 | 0.5-2 | --- | --- | --- | --- | --- | --- | --- | 4.5+ |
| | 2-4 | --- | --- | --- | --- | --- | --- | --- | 4.5+ |
| | 4-6 | --- | --- | --- | --- | --- | --- | --- | 4.5+ |
| | 6-8 | --- | --- | --- | --- | --- | --- | --- | 3.0 |
| | 8-10 | --- | --- | --- | --- | --- | --- | --- | 4.5+ |
| | 13-15 | --- | --- | --- | 17.4% | 129.1 | 110.0 | 5.1 | 4.5+ |
| | 18-20 | 84 | 36 | 23 | 17.6% | --- | --- | --- | 3.5 |
| | 28.5-30 | 15 | --- | --- | 0.0% | --- | --- | --- | --- |
| | 35.5-36 | --- | --- | --- | --- | --- | --- | --- | 4.5+ |
| | 37.4-38.3 | --- | --- | --- | 16.3% | 131.2 | 112.9 | 15.9 | --- |
| | 42.7-43.6 | --- | --- | --- | 21.8% | 127.0 | 104.3 | 13.3 | --- |
| | 49-49.8 | --- | --- | --- | 14.3% | 135.9 | 118.9 | 17.4 | --- |
| | | | | | | | | | |
| B-2 | 0-2 | --- | --- | --- | --- | --- | --- | --- | 4.5+ |
| | 2-4 | --- | --- | --- | --- | --- | --- | --- | 4.5+ |
| | 4-6 | --- | --- | --- | --- | --- | --- | --- | 4.5+ |
| | 6-7 | --- | --- | --- | --- | --- | --- | --- | 4.5+ |
| | 19.5-21 | 95 | 54 | 39 | 20.8% | --- | --- | --- | --- |
| | 25-27 | --- | --- | --- | 20.0% | 130.7 | 108.9 | 4.6 | 4.0 |
| | 30-32 | 91 | 54 | 39 | 22.8% | --- | --- | --- | 3.0 |
| | 35-37 | --- | --- | --- | --- | --- | --- | --- | 3.0 |
| | 40-42 | --- | --- | --- | 22.6% | 128.6 | 104.9 | 2.4 | 4.0 |
| | 45-46.5 | --- | --- | --- | --- | --- | --- | --- | 4.5+ |
| | 49-50 | --- | --- | --- | 20.6% | 117.9 | 97.8 | 4.5 | 4.5+ |

City Manager
Austin, Texas

The undersigned, in compliance with the Invitation for Bids for construction of the following Project: South Austin Regional Wastewater Treatment Plant Thickener Improvements Project

(CIP ID# 3333.016 ) (IFB# 6100 CLMC558 ) for the City of Austin, Texas, 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 for the lump sum price of:

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 Living $13.03 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 $13.03 minimum wage required.

**EXCAVATION SAFETY SYSTEMS UNIT PRICES:** The undersigned Bidder agrees that the Base Bid for the Work includes the following amounts in the Bid for excavation safety systems as specified in Item Number 509S of the Specifications and in case of an authorized adjustment to the scope of Work, the following unit price(s) will be used in adjusting the Contract Amount:

| Quantity | Unit | Item Description | Unit Price | Amount |
|---|---|---|---|---|
| 720 | ln. ft. | Trench Safety systems | $_____ | $_____ |

**TOTAL BID**

**TOTAL BID**..... = $ _____
Figures

(Total Bid includes Base Bid and Excavation Safety Systems Unit Prices.)

**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 ninety (90) 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 eight hundred and fifty four_(854) **Calendar** Days. **If a Substantial Completion date has been specified, the Bidder further agrees to reach Final Completion within ninety (90) 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 complete the Work** or to 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 its bid, in consideration for the waiver of its 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, five hundred dollars ($ 1,500) 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 one thousand, five hundred dollars ($ 1,500) 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.

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).

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 _____

Addendum No. 5 dated _____ Received _____

**BID DOCUMENT EXECUTION AND ACKNOWLEDGEMENT:**

The undersigned Bidder certifies that he/she has read and understands the Section 00020 Invitation for Bids, the Section 00100 Instructions to Bidders, and all other requirements applicable to the bidding process provided in the Bid and Contract Documents.

Bidder will initial each of the blanks set forth below to represent and certify that the Bidder has completed, executed, and enclosed the corresponding supplemental Bid Documents with its Bid.

***Bidder acknowledges and agrees by its signature below that in addition to any signatures required to be set forth in the following supplemental Bid Documents, Bidder is bound to the terms and conditions of each of the following documents, which are incorporated herein by reference:***

____ 00440 Affidavit - Prohibited Activities

____ 00475 Nonresident Bidder Provisions

____ 00630 Non-Discrimination and Non-Retaliation Certificate

**(NOTE: THIS FORM MUST STILL BE SEPARATELY SIGNED AND PROPERLY NOTARIZED)**

____ MBE/WBE Compliance Document

| | |
|---|---|
| _____ | _____ |
| Secretary, *if Bidder is a Corporation | Bidder |
| | _____ |
| (Seal) | Authorized Signature |
| | _____ |
| | Title |
| | _____ |
| | Date |
| | _____ |
| | _____ |
| | Address |
| | _____ |
| | Telephone Number / FAX Number |
| | _____ |
| | Email Address for Person Signing Bid |
| | _____ |
| | Email Address for Bidder's Primary Contact Person |

* Copy of Corporate Resolution and minutes with certificate of officer of Bidder as to authority of signatory to bind Bidder is to be signed and dated no earlier than one week before Bid date, and attached to this document.

**End**

# STATEMENT OF BIDDERS EXPERIENCE

Section 00400

**Project Name:** South Austin Regional WWTP Thickener Improvements Project

**IFB Number**: 6100 CLMC558

**CIP ID Number:** 3333.016

**Bidder's Name:** _____

**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. Any information in Attachments A through I 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

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

**IFB Number: 6100 CLMC558**

**CIP ID Number: 3333.016**

**A.** ***Name of Bidder:*** _____

**B.** ***Bidder's Permanent Address:*** _____

**C.** ***Bidder's Phone No.: (  ) _____-_____***

**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 any 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 judgments, claims, or lawsuits against the Bidder?***

YES (____) NO (____)

**G.** ***Does Bidder currently have any pending claims, judgments 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)

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

**IFB Number: 6100 CLMC558**

**CIP ID Number: 3333.016**

**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. Bidders should refer to the 1.2 Description of Work section in contract document 01010 Summary of Work to determine what is reasonably comparable. Decisions on "comparability" are at the complete discretion of the OWNER.

Bidder must have completed the projects within the past five (5) years.

**PROJECT NO. 1:**

Name of Project: _____

Location: _____

OWNER's Name and 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:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

**PROJECT NO. 2:**

Name of Project: _____

Location: _____

OWNER's Name and 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:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

**PROJECT NO. 3:**

Name of Project: _____

Location: _____

OWNER's Name and 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 C

## PROJECT MANAGER & SUPERINTENDENT EXPERIENCE

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

**IFB Number: 6100 CLMC558**

**CIP ID Number: 3333.016**

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):** _____

**(Insert Resumes & Experience)**

## ATTACHMENT D

(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 five (5) 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, installation and startup of circular clarifiers or sludge thickener mechanisms

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.

**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 information:

Company Name: _____

Permanent Address: _____

Phone Number: _____

Number 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 the size, scope, and/or complexity for this item:

_____

_____

_____

_____

_____

_____

## ATTACHMENT E

## AVAILABLE EQUIPMENT LIST

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

**Name of Bidder:** _____

**IFB Number: 6100 CLMC558**

**CIP ID Number: 3333.016**

**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

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

**Name of Bidder:** _____

**IFB Number:** **6100 CLMC558**

**CIP ID Number:** **3333.016**

**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** | | | |
| **Other** | | | |

Use additional pages, as necessary

## ATTACHMENT G

## CURRENT PROJECT LISTING (INCLUDING ALL CITY OF AUSTIN PROJECTS)

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

**Name of Bidder:** _____

**IFB Number:** **6100 CLMC558**

**CIP ID Number:** **3333.016**

**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: _____

_____

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: _____

_____

Use additional pages, as necessary

## ATTACHMENT H

## COMPLETED PROJECTS (INCLUDING ALL CITY OF AUSTIN PROJECTS)

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

**Name of Bidder:** _____

**IFB Number:** **6100 CLMC558**

**CIP ID Number:** **3333.016**

**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: _____

_____

_____

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

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

**Name of Bidder:** _____

**IFB Number:** **6100 CLMC558**

**CIP ID Number:** **3333.016**

THE STATE OF TEXAS

COUNTY OF TRAVIS

I certify that my responses and the information provided in Attachments E-I 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**

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# CERTIFICATE OF NON-SUSPENSION OR DEBARMENT

Section 00405

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.

PROJECT Name South Austin Regional Wastewater Treatment Plant Thickener Improvements Project

PROJECT Address 1017 Fallwell Lane Del Valle, TX 78617

CONTRACTOR'S Name _____

Signed by (Authorized Representative) _____

Printed Name: _____

Title _____

Date _____

**END**

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# SAFETY RECORD QUESTIONNAIRE & STATEMENT OF BIDDER'S SAFETY EXPERIENCE

**(To Be Submitted Post-Bid)**

**Project:** **South Austin Regional Wastewater Treatment Plant Thickener Improvements Project**

**CIP ID Number:** 3333.016

**IFB Number:** 6100 CLMC558

Pursuant to Section 252.0435 of the Local Government Code, the Austin City Council will consider the safety records of potential contractors prior to awarding bids on City contracts. The City of Austin has adopted the following written definitions and criteria for accurately determining the safety record of a Bidder prior to awarding bids on City contracts. The term "Bidder" includes the firm, corporation, partnership, or other legal entity represented by the Bidder or anyone acting for such firm, corporation, partnership or other entity submitting the bid. The definitions and criteria for determining the safety record of a Bidder are:

> "Citations" include notices of violation, notices of enforcement, suspension/revocations of state or federal licenses or registrations, fines assessed pending criminal complaints, indictments, or convictions, administrative orders, draft orders, final orders, and judicial final judgments. Notice of Violations and Notice of Enforcement received from the TCEQ shall include those classified as major violations and moderate violations under the TCEQ'S regulations for documentation of Compliance History, 30 Texas Administrative Code, Chapter 60.2 (c) (1) and (2).
>
> "Environmental Protection Agency" includes, but is not limited to the Texas Commission on Environmental Quality (TCEQ), the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, the Texas Department of Health, the Texas Parks and Wildlife Department, the Structural Pest Control Service, agencies of local governments responsible for enforcing environmental protection laws or regulations, and similar regulatory agencies of other states of the United States.

1. If the Bidder's response to the following questions reveals more than two (2) cases in which final orders have been entered by the Occupational Safety and Health Review Commission (OSHRC) against the Bidder for serious violations of Occupational Safety & Health Administration (OSHA) regulations within the past five (5) years, the City will, at its discretion, determine whether to disqualify the Bidder.
2. If the Bidder's response to the following questions reveals more than one (1) case in which Bidder has received a citation or for which final orders have been entered from an environmental protection agency for violations within the past five (5) years, the City will, at its discretion, determine whether to disqualify the Bidder.
3. If the Bidder's response to the following questions reveals that the Bidder has been convicted of a criminal offense within the past ten (10) years or has been subject to a judgment for a negligent act or omission, which resulted in serious bodily harm or death, at its discretion, the City will determine whether to disqualify the Bidder.
4. The City may consider the responses to each question listed below separately when making a discretionary determination of whether to disqualify a Bidder and it may consider the cumulative impact of the information generated by the Bidder's responses in making the determination.

5. The Bidder acknowledges the requirements for Safety Training (listed in Section 00700) must be met before any work commences on the project.
6. In order to consider the safety records of potential contractors prior to awarding bids on City contracts, the City requires that Bidders answer the following questions and submit them upon request:

**QUESTION ONE**

Has the Bidder received any Citations for violations of OSHA within the past five (5) years? ❒ Yes ❒ No

**QUESTION TWO**

Has the Bidder received any Citations for violations of environmental protection laws or regulations within the past five (5) years? ❒ Yes ❒ No

**QUESTION THREE**

Has the Bidder ever been convicted, within the past ten (10) years, of a criminal offense or has been subject to a judgment for a negligent act or omission, which resulted in serious bodily injury or death? ❒ Yes ❒ No

---

If the Bidder has indicated "Yes" to any question above, the Bidder must provide to the City, with its bid submission, the following information:

Date of Citation or offense and location where violation or offense occurred, type of violation or offense, final disposition of violation or offense, if any, and penalty assessed.

---

In addition, the City will utilize the following information and in its discretion, as additional support to make any discretionary determination of whether to disqualify a Bidder. Accordingly, Bidder must answer the following questions and provide evidence that it meets minimum OSHA construction safety standards and has a lost time injury rate that does not exceed the limits established below:

1. Does the Bidder have a written construction safety program? ❒ Yes ❒ No
2. Does the Bidder conduct regular construction site safety inspections? ❒ Yes ❒ No
3. Does the Bidder have an active construction safety training program? ❒ Yes ❒ No
4. Does the Bidder or affected subcontractors have competent persons in the following areas (as applicable to the scope of the current Project):

| | | | |
|---|---|---|---|
| A. Scaffolding | ❒ Yes | ❒ No | ❒ N/A |
| B. Excavation | ❒ Yes | ❒ No | ❒ N/A |
| C. Cranes & Hoists | ❒ Yes | ❒ No | ❒ N/A |
| D. Electrical | ❒ Yes | ❒ No | ❒ N/A |
| E. Fall Protection | ❒ Yes | ❒ No | ❒ N/A |
| F. Confined Spaces | ❒ Yes | ❒ No | ❒ N/A |
| G. Material Handling | ❒ Yes | ❒ No | ❒ N/A |
| H. Demolition | ❒ Yes | ❒ No | ❒ N/A |
| I. Steel Erection | ❒ Yes | ❒ No | ❒ N/A |

J. Underground Construction ❒ Yes ❒ No ❒ N/A

5. Does the company have a lost time injury rate and a total recordable injury rate of less than or equal to the national average for North American Industrial Classification System (NAICS) Category 23 for each of the past five (5) years? (Attach the Bidder's OSHA 300 and 300A logs for the past five (5) years) ❒ Yes ❒ No

6. Does the Bidder have an experience modifier rate of 1.0 or less? (Attach the Bidder's NCCI workers compensation experience rating sheets for the past five (5) years) ❒ Yes ❒ No

7. Has the Bidder had any OSHA inspections within the past six (6) months? ❒ Yes ❒ No
(If "YES", provide sufficient documentation to indicate the nature of the inspection, the findings, and magnitude of the issues.)

---

## ACKNOWLEDGEMENT

THE STATE OF TEXAS

COUNTY OF TRAVIS

I certify that my responses and the information provided are true and correct to the best of my personal knowledge and belief and that I have made no willful misrepresentations in this Questionnaire, 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 questionnaire 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**

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**CITY OF AUSTIN**

**BIDDER'S AFFIDAVIT OF NON-COLLUSION,**

**NON-CONFLICT OF INTEREST, AND ANTI-LOBBYING FOR**

**IFB NO. 6100 CLMC558**

**FOR South Austin Regional Wastewater Treatment Plant Thickener Improvements Project**

**CIP ID Number: 3333.016**

**State of Texas**

**County of Travis**

**The undersigned "Affiant" is a duly authorized representative of the bidder for the purpose of making this Affidavit, and, after being first duly sworn, has deposed and stated and hereby deposes and states, to the best of his or her personal knowledge and belief as follows:**

The term **"Bidder"**, as used herein, includes the individual or business entity submitting the bid and for the purpose of this Affidavit 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 have filed a 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.** As set forth in paragraph 1.i. of the Instructions to Bidders Section 00100, between the date that the Invitation for Bid was issued and the date of full execution of the Contract, Bidder has not made and will not make a representation to a member of the City Council, a member of a City Board, or any other official, employee or agent of the City, other than the authorized contact person for the solicitation, except as permitted by the Ordinance.

If the Bidder cannot affirmatively swear and subscribe to the forgoing statements, the Bidder shall provide a detailed written explanation in the space provided below or, as necessary, on separate pages to be annexed hereto.

Signature: _____ Date: _____

Printed Name: _____

Title: _____

Firm/Entity: _____

Subscribed and sworn to before me this ____ day of _____, 20__.

_____ My Commission Expires _____
Notary Public

BIDDER'S EXPLANATION:

_____

**END**

# NONRESIDENT BIDDER PROVISIONS

Section 00475

**CIP ID Number: 3333.016**

Bidder must answer the following questions in accordance with Vernon's Texas Statutes and Codes Annotated Government Code § 2252.002, as amended:

A. Is the bidder that is making and submitting this bid a "resident bidder" or a "non-resident bidder"?

Answer: _____

(1) Texas Resident Bidder - 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.

(2) Nonresident Bidder - A bidder who is not a Texas Resident Bidder.

B. If the Bidder is a "Nonresident Bidder", does the state, in which the Nonresident Bidder's principal place of business is located, have a law requiring a Nonresident Bidder of that state to bid a certain amount or percentage under the bid of a Resident Bidder of that state in order for the nonresident bidder of that state to be awarded a contract on his bid in such state?

Answer: Yes or No Which state? _____

If the answer to Question B is "yes", then what amount or percentage must a Texas Resident Bidder bid under the bid price of a Resident Bidder of that state in order to be awarded a contract on such bid in said state?

Answer: _____

_____

Signature

**END**

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**STATE OF TEXAS**
**COUNTY OF TRAVIS**

THIS AGREEMENT is made and entered into this _____ day of _____, 20____, 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:

South Austin Regional Wastewater Treatment Plant Thickener Improvements 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** complete construction of the improvements, as required by the Project Manual, Drawings and Addenda for the Work within **eight hundred and fifty four (854) Calendar** Days. **If a Substantial Completion date has been specified, the CONTRACTOR further agrees to reach Final Completion within ninety (90) 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.

SAMPLE

**OWNER**

**By:**_____
City of Austin (Signature)

_____
Date

_____
Title of Signatory

APPROVED AS TO FORM:

By:_____
Law Department

_____
Date

**§ CONTRACTOR**
**§**
**§ By:**_____
**§** (Signature)
**§**
**§** _____
**§** Date
**§** _____
**§** Printed Name of Signatory
**§**
**§** _____
**§** Title of Signatory, Authorized Representative
**§**
**§ ATTEST (as applicable)**
**§**
**§**_____
**§ Secretary of Corporate Bidder or Corporate General Partner** *

*Copy of Corporate Resolution and minutes with certificate of officer of CONTRACTOR as to authority of signatory to bind CONTRACTOR is to be signed, dated no earlier than one week before the date of award of Contract, and attached to this document.

**END**

SAMPLE

# PERFORMANCE BOND

Section 00610

STATE OF TEXAS

COUNTY OF TRAVIS

Bond No. _____

C.I.P. ID No. 3333.016

Project Name South Austin Regional WWTP Thickener Improvements Project

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 TRAVIS

Bond No. _____

C.I.P. ID No. 3333.016

Project Name South Austin Regional WWTP Thickener Improvements Project

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



**CIP ID Number: 3333.016**

**City of Austin, Texas**
**Equal Employment/Fair Housing Office**

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

I hereby certify that 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.

Dated this _____ day of _____, _____.

CONTRACTOR _____

Authorized Signature _____

Title _____

END

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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 shall comply with the Regulations relative to nondiscrimination in Federally-assisted programs of the Department of Transportation (hereinafter, "DOT") Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), 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, shall 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 shall not participate either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.

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 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 Regulations or directives issued pursuant thereto, and shall permit access to its book, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or the Texas Department of Transportation to be pertinent to ascertain compliance with such Regulations, orders 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 shall so certify to the Recipient, or the Texas Department of Transportation as appropriate, and shall 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 shall impose such contract sanctions as it or the Texas Department of Transportation 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) cancellation, termination or suspension of the contract, in whole or in part.

6. Incorporation of Provisions: The contractor shall include the provisions of paragraphs (1) through (6) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto. The contractor shall take such action with respect to any subcontract or procurement as the Recipient or the Texas Department of Transportation may direct as a means of enforcing such provisions including sanctions for non-compliance: Provided, however, that, in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the Recipient to enter into such litigation to protect the

interests of the Recipient, and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

(DOT 1050.2, 08/24/71)

**Contractor's full name and entity status:**

_____

**Signature, Authorized Representative of Contractor**

_____

**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: SAR WWTP Thickener Improvements Project
C.I.P. No.: 3333.016
Project Location: 1017 Fallwell Lane Del Valle, TX 78617
Managing Dept.: Public Works
Contract No.:_____
Project Mgr.: John Wepryk

**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 | | | | | |
| | ☐ 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**<br>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**<br>☐ Umbrella Form<br>☐ Excess Liability Follow Form | | | | Occurrence | $ |
| | | | | | Aggregate | $ |
| | **Workers Compensation and Employers Liability**<br>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**<br>As defined in the Policy, does the Policy provide: | | | | Each Claim | $ |
| | ☐ Yes ☐ No -- 30 Day Notice of Cancellation<br>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: South Austin Regional Wastewater Treatment Plant Thickener Improvements Project

Project Manager: John Wepryk, P.E.

FDU No.: 4480 2307 8078

CIP ID No: 3333.016

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 | Date |
|---|---|---|
| Elaine Hart | | |
| ELAINE HART | CHIEF FINANCIAL OFFICER | March 20, 2014 |

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**

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## 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 |
| 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. 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 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 one (1) Project Manual with original signatures, one (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 "Competent Person(s)" on general safety and excavation safety measures along with certifications or other documentation of the safety representative's qualifications;

**.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** Appropriate safety training certificates for workers that will initially be on site;

**.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 Amending and Supplementing Contract Documents:**

**3.3.1** The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:

**.1** Change Order.

**.2** Change Directive.

**.3** Time Extension Request.

**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 an English-speaking, competent Superintendent on the Work at all times that work is in progress. 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 $13.03 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 $13.03 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.B.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 Contact 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. The Safety Representative shall report directly to a company executive, not an on site project manager. 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 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 and any effected Subcontractor's total overhead and profit. 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 actual cost of CONTRACTOR's bond(s) on the extra Work will be paid based on invoices from surety. No charge for superintendence will be made 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 effected 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** 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** 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.

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

**.1** for inspections, tests or approvals covered by paragraphs 13.3.3 and 13.3.4 below;

**.2** that costs incurred for tests or inspections conducted pursuant to paragraph 13.4.3 shall be paid as provided in paragraph 13.4.3;

**.3** for reinspecting or retesting defective Work, including any associated costs incurred by the testing laboratory for cancelled tests or standby time; and

**.4** as otherwise specifically provided in the Contract Documents.

**13.3.3** 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 the required certificates of inspection or approval.

**13.3.4** CONTRACTOR shall also be responsible for arranging and obtaining and shall pay 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 in the Work.

**13.3.5** All testing laboratories shall meet the requirements of ASTM E-329.

## 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** No 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; and

**14.10.9** 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. If the sole remaining unfinished item to complete the Work is the reestablishment of vegetation, CONTRACTOR may execute a revegetation letter with fiscal posted (letter of credit) to ensure completion of this item. This Work must be accomplished within one hundred twenty (120) Calendar Days of the date of Final Completion of the Work. When the permanent erosion control has been established, OWNER will initiate an inspection for final acceptance of the erosion controls. If the revegetation is not completed within the one hundred twenty (120) Calendar Days, OWNER, at its option, may complete the Work using the posted fiscal.

**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;

**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; and

**15.2.4** for all claims incurred in settlement of terminated contracts with Subcontractors, Suppliers and others, including 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. CONTRACTOR agrees to negotiate in good faith with Subcontractors, Suppliers and others to mitigate OWNER's cost.

**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 Progressive 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.

http://www.austintexas.gov/department/contract-management

**End**

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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):

*Name: Danny M. Hurtado*

*CDM Smith Inc.*

*Address: 12357-A Riata Trace Pkwy Ste. 210 Austin, TX 78727"*

Add the following definitions:

**"1.51** Commissioning Authority or Agent - A consultant retained by the OWNER charged with supporting E/A in monitoring the Work for conformance with the Contract Documents, and with assisting in the facility's start-up and testing as a member of the commissioning team."

**"1.52** Allowance - Allowance is defined as "a not-to-be-exceeded amount", either individually or in the aggregate, which is established between the Owner and the Contractor as part of its Bid Proposal when the precise scope of a particular line item(s) has not been defined to a level which is adequate for the Contractor to provide a definitive line item pricing for that particular scope of Work. The use of any Allowances by the Contractor will be subject to the Owner's sole approval and it is the Owner's intent to minimize the use of Allowances to the fullest extent possible. For any Allowances which the Owner allows the Contractor to use, the following rules shall apply: (i) Allowances shall cover the cost to the Contractor of the Cost of Work; (ii) Contractor's overhead and profit associated with the stated Allowance shall be included in the Allowance; and (iii) upon completion of the portion of the Work subject to an Allowance, the Contract Amount for that portion of the Work will be adjusted based upon the approved actual cost of the Work, which will not exceed the approved aggregate amount of the Allowances.

**"1.53** Mobilization Prompt Payment Program – The Owner's Mobilization Prompt Payment Program, will allow bimonthly payments during "critical mobilization stages" as specified in the Contract Documents by the Prime Contractor. The Mobilization Prompt Payment Program will only apply to projects with a construction cost of greater than $2,000,000."

## ARTICLE 2 - PRELIMINARY MATTERS

### 2.4 Before Starting Construction:

Add the following modification to the end of 2.4.2.1:

> "The Baseline Schedule and schedule submittals for Projects in the Mobilization Prompt Payment Program, must identify periods of "critical mobilization." The periods of critical mobilization will include the first two months of the Contract Time and additional periods identified by the Contractor and approved by Owner when peak Subcontractor mobilization will occur."

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 shall be broken out by trade and split between materials and labor. Prices will include an appropriate amount of overhead and profit applicable to each item of Work;"

## ARTICLE 5 - BONDS AND INSURANCE

**"5.3 Insurance:**

**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 licensed 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, Contract Management Department, 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, endorsement 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.

## 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:

.1 General Permit Program

.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.

**6.7 Laws and Regulations:** Add the following:

"**6.7.4** This Work is subject to the Texas Pollution Discharge Elimination System (TPDES) permitting requirements for the installation and maintenance of temporary and permanent erosion and sediment controls and storm water pollution prevention measures throughout the construction period.

OWNER has prepared a Storm Water Pollution Prevention Plan (SWPPP). Reference Section 01096 for this SWPPP.

OWNER shall file the Owner's Notice of Intent to the Texas Commission on Environmental Quality (TCEQ). OWNER shall pay the TPDES storm water application fee.

CONTRACTOR's responsibilities are as follows:

.1 Obtain a signed certification statement from all Subcontractors responsible for implementing the erosion / sedimentation controls and other best management practices that are part of the SWPPP. This statement shall indicate that the Subcontractor understands the permit requirements. The certified statement forms shall be attached to and become part of the SWPPP.

.2 Fill out the TCEQ's "Construction Site Notice" form, which is Attachment 2 to the TPDES General Permit TXR150000 (form available from OWNER or on the Internet at http://www.tceq.state.tx.us/assets/public/permitting/waterquality/attachments/stormwater/txr152d2.pdf and post it near the main entrance of the Work, or at multiple postings if the Work is linear. Mail a copy of the completed Construction Site Notice form to the local Municipal Separate Storm Sewer Systems (MS4) representative:

TPDES Program Coordinator
City of Austin – WPD – ERM
P.O. Box 1088
Austin, TX 78767

.3 Maintain all erosion/sedimentation controls and other protective measures identified in the SWPPP in effective operating condition.

.4 Perform inspections every five (5) working days and after every ½ inch rainfall event, noting the following observations on an inspection form provided by OWNER:

- Locations of discharges of sediment or other pollutants from the site.
- Locations of storm water / erosion / sedimentation controls that are in need of maintenance.
- Locations of storm water / erosion / sedimentation controls that are not performing, failing to operate, or are inadequate.
- Locations where additional storm water / erosion / sedimentation controls are needed.

.5 Maintain at Work site at all times a copy of the SWPPP (with all updates, as described below) and inspection reports.

.6 Update the SWPPP as necessary to comply with TPDES permitting requirements, which includes noting changes in erosion / sedimentation controls and other best management practices that are

part of the SWPPP and which may be necessary due to the results of inspection reports. Any SWPPP revisions or updates must be signed and certified by a Certified Professional in Erosion and Sedimentation Control (CPESC) or a Registered Professional Engineer. If the SWPPP includes engineering calculations, then SWPPP must be sealed and signed by a Registered Professional Engineer.

.7 Upon completion of the Work, provide TPDES records to OWNER."

**6.11 Safety and Protection:** Add the following to paragraph 6.11.3:

**"6.11.3** At the minimum, the safety representative will be certified in personal protective equipment, hazard communication, demolition and blasting, trench/excavation, hand and power tools, welding/cutting, cranes/derricks/hoists/conveyors/, scaffolding, confined space, CPR and first aid."

## ARTICLE 11 - CHANGE OF CONTRACT AMOUNT

**11.4 Determination of Value of Work:** Add the following to paragraph 11.4.1.2:

"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 |

- 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."

## ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

**14.1 Application for Progress Payment:** Delete 14.1.1 and replace with the following (changes to the original text are identified by underling):

"14.1.1 No more often than once a month, unless authorized as part of the Mobilization Prompt Payment Program, CONTRACTOR shall submit to Owner's Representative for review a completed and executed Application for Payment, in a form acceptable to OWNER, covering the Work completed as of the date of the Application and not previously paid and accompanied by such supporting documentation as required by the Contract Documents.

Add the following .1:

**.1 - Mobilization Prompt Payment Program.** During critical mobilization periods, as identified by the CONTRACTOR and as approved by OWNER in accordance with 00700 2.4.2.1 of this Contract, CONTRACTOR shall submit bi-monthly Applications for Payment. The additional Pay Applications will include any costs accrued during the periods of critical mobilization. The Program will allow the CONTRACTOR and Subcontractors to invoice for costs as they are accrued during periods of critical mobilization. The CONTRACTOR shall submit bimonthly invoices to the OWNER for such costs. The CONTRACTOR shall pay Subcontractors for costs within 10 days of receipt of payment from OWNER.

**14.1 Application for Progress Payment:** Delete 14.1.6.3 and replace with the following:

".3 Contract time statement form signed by CONTRACTOR and Owner's Representative. If CONTRACTOR does not agree with the number of accumulated days charged, CONTRACTOR shall file a Claim in accordance with Article 16.1, Filing of Claims."

**14.7 Substantial Completion:**

Reference 14.7.1, and add the following provision:

"**14.7.1.1** For the South Austin Regional WWTP Thickener Improvements Project, Substantial Completion for the project means that approved testing (including Performance Acceptance Tests) and start-up of all process units and equipment and all DCS and electrical improvements to allow onsite monitoring of processes and equipment has been completed."

**14.8 Partial Utilization:** Delete 14.8.1 and replace with the following (changes to the original text are identified by underlining):

".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 will certify to Owner's Representative that such part of the Work is substantially complete and request Owner's Representative to issue a <u>notice specifying what portion of the Work is substantially complete for the purpose of payment and what Work remains to be done on the portion being accepted</u>. 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 <u>notice specifying what portion of the Work is partially completed for the purpose of payment and what Work remains to be done on the portion being accepted</u>. The provisions of paragraphs 14.7.1 and 14.7.2 will apply with respect to <u>the notice specifying what portion of the Work is partially completed for the purpose of payment and what Work remains to be done on the portion being accepted</u>."

**14.10 Final Application for Payment:** Add the following paragraph(s) to 14.10:

".10 TPDES records in accordance with 6.7.4."

**14.11 Final Payment and Acceptance:**

Add the following to paragraph 14.11.1:

"If the sole remaining, unfinished item of the Work is revegetation or other permanent erosion control, including, if applicable, tree mitigation, (collectively, the "revegetation"), the CONTRACTOR may execute a zero-cost "Revegetation Change Order" for such Work and post fiscal security acceptable to Owner to ensure completion of the revegetation.

The fiscal security will be a bond, letter of credit, or cash escrow in a form promulgated by OWNER and posted with OWNER's Watershed Protection Department.

Upon receipt of the executed Revegetation Change Order and fiscal security, the Owner's Representative will issue a conditional letter of final acceptance to the CONTRACTOR for the Work, excluding the revegetation, which establishes the Final Completion Date for that Work and initiates the one year warranty period.

This revegetation must be accomplished within 120 Calendar Days of the date of Final Completion of the balance of the Work or such other stipulated time for completion directed in the Change Order. When the revegetation has been established, OWNER will inspect for final acceptance of that portion of the Work and, as applicable, initiate the one year warranty period for that Work.

If the revegetation is not completed within the 120 Calendar Days or such other time set forth in the Change Order, the OWNER, at its option, may complete the Work using the posted fiscal security."

## 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._____

**END**

# PART 1 – GENERAL

## 1.1 SECURITY POLICY

**Paramount to the Austin Water Utility are 1) the production and delivery of an adequate supply of safe drinking water to all customers, 2) uninterrupted collection of wastewater, without spills, and 3) and adequate processing of wastewater to safely return to the environment . The Utility 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, sabotage, or other acts that might threaten the security of these facilities, the quality of the drinking water, or the quality of treated wastewater.**

## 1.2 RELATED DOCUMENTS

The most current version of the Austin Water Utility's "Facility Security Procedures for Contractors, SP-1070" shall be considered a part of this Specification Section.

## 1.3 SECURITY PROCEDURE

The CONTRACTOR shall become familiar with this Specification Section and the most current version of the Austin Water Utility's "Facility Security Procedure for Contractors, SP-1070", 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 the Utility no later than the Pre-construction Conference and before any access is allowed to the work site.

## 1.4 SUBMITTALS

The CONTRACTOR shall submit a "Contractor's Acknowledgement" form (Appendix A of "Facility Security Procedure for Contractors, SP-1070") 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.

The CONTRACTOR shall submit a "Contractor's Acknowledgement" form (Appendix A of "Facility Security Procedure for Contractors, SP-1070") 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.

The CONTRACTOR shall submit an "Application for Authorization to Enter Secured Austin Water Utility Facilities" form (Appendix B of "Facility Security Procedure for Contractors, SP-1070") for every Contractor's and Subcontractors' employee that will need to enter the secured area. Each application shall be accompanied by a complete "Background Security Check" (including fingerprint card), performed by a governmental law enforcement agency, as described in the "Facility Security Procedure for Contractors, SP-1070". These submittals shall each be an original document, with original signatures. Copies or facsimiles will not be accepted.

The CONTRACTOR shall submit a sample of their company's Security Identification Badge, sized and formatted as described in the "Facility Security Procedure for Contractors, SP-1070".

## PART 2 – PRODUCTS

**AS PART OF CONTRACT MOBILIZATION COSTS, THE CONTRACTOR SHALL INCLUDE A $1,000 ALLOWANCE FOR PROCUREMENT OF THE PERMANENT BADGE DECALS OR ID BADGE BLANKS.** These items shall be ordered by, and delivered directly to the UTILITY from vendors already designated by the UTILITY to provide these specialty items. The Allowance shall be reduced or increased by Change Order to match the exact cost of procurement.

## PART 3 – EXECUTION

### 3.1 SITE SECURITY

The CONTRACTOR shall be responsible for maintaining absolute site security and for following all provisions of the UTILITY's "Facility Security Procedures for Contractors, SP-1070" in good faith. Failure to follow any of the provisions of this procedure shall be considered a breech of this CONTRACT.

#### 3.1.1 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.

#### 3.1.2 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 as described in the "Facility Security Procedures for Contractors, SP-1070"

### 3.2 PERSONNEL

Personnel access to the construction site shall be limited to those identified in the "Facility Security Procedures for Contractors, SP-1070", 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, as described in SP-1070, either issued by the CONTRACTOR or SUBCONTRACTOR with the proper Utility-applied authorization decal, or a badge issued by the UTILITY. 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.

#### 3.2.1 ACCESS AUTHORIZATION

The CONTRACTOR shall provide an original "Application for Authorization to Enter Secured Austin Water Utility Facilities" (including Background Security Check and fingerprint card) for each person who will be working on the site at least five (5) working days prior to the date that person is scheduled to begin work on the site. The UTILITY shall determine whether or not to grant each person access to the work site based upon the results of the Background Security Check. Random audits shall be performed by the UTILITY on the results of the Background Security Checks.

The original "Application for Authorization to Enter Secured Austin Water Utility Facilities" shall be kept on file by the Utility's Facility Manager or Project Manager. A copy of this document will be returned to the

CONTRACTOR with an indication of the approval or denial of access for the named employee. The Background Security Check and fingerprint card shall be returned to the CONTRACTOR also, but must be kept available for audit until one year following Final Completion.

### 3.2.2 IDENTIFICATION BADGES

The CONTRACTOR shall provide Security Identification Badges for each of their employees and their SUBCONTRACTORS' employees. The badges shall be picture badges conforming to all the requirements of the "Facility Security Procedure for Contractors, SP-1070". 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. Following a satisfactory review of each person's Background Security Check, and presentation of a government-issued picture identification, the UTILITY will apply a permanent access authorization decal to the badge.

--- End of Section 00819 ---

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## SECTION 00100 – INSTRUCTIONS TO BIDDERS

Delete Paragraph 13, Partnering, and replace with the following:

"**13. Partnering**

To complete this Work most beneficially for all parties, OWNER desires to form a Partnering Team among OWNER, E/A, 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. The partnering relationship will be multilateral in makeup and participation will be totally voluntary. Refer to Section 01100, Special Project Procedures, and/or Section 01200, Project Meetings, for clarification of the intents and responsibilities of the persons and entities entering into the partnering charter."

**END**

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## I. Payment

A. Classification Definitions, Building and Heavy and Highway

Definitions for Building Construction and Heavy and Highway classifications shall conform to the current "Dictionary of Occupational Titles" as published by the U.S. Department of Labor.

B. Minimum Wages

Workers on Project shall be paid not less than wage rates, including fringe benefits, as published by the Department of Labor (DOL) or the $13.03 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 $13.03 minimum wage required.

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.

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 29CFR 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.

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.

C. Overtime Requirements

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.

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.

## II. Apprentices

Locally & Federally Funded Projects

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.

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 Sub-subcontractor 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.

## III. Withholding of Payments

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.

## IV. Payrolls

A. CONTRACTOR shall keep records showing:

1. the name, address and occupation of each worker employed by the CONTRACTOR or subcontractor(s) in the construction of the public work.

2. the actual per diem wages paid to each worker.

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. Payroll Deduction Authorization Form. CONTRACTOR, Subcontractor, and Subsubcontractor 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.

B. 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.

C. 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:

1. name of signatory party and title,
2. name of project, payroll period and
3. name of CONTRACTOR or Subcontractor.

The signed letter attests that the payroll complies with 29CFR issued by the Secretary of Labor.

D. Federal Funding

In the event that federal funding is used:

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.

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.

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.

## V. Noncompliance

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.

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.

## VI. Area Practice

A. 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.

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.

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.

B. For projects that involve both Building Construction and Heavy and Highway trades, the following classifications shall be used:

1. A multiple classification shall be used if Building Construction items are more than 20% of the Heavy and Highway project cost.

2. A multiple classification shall be used if Heavy and Highway Construction items are more than 20% of the Building Construction Project cost.

C. 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.

## VII. Texas Open Records Act

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**

**End**

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## WAGE RATE DETERMINATION

### BUILDING CONSTRUCTION TYPE

COUNTY NAME : TRAVIS

Wages based on DOL Prevailing Wage Rate General Decision:TX160323 5/27/2016 TX323 and City of Austin Ordinance #20160324-015

*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 $13.03/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) | $ 21.57 | $ 21.57 | $ 10.02 | $ 31.59 |
| Boilermaker | $ 23.14 | $ 23.14 | $ 21.55 | $ 44.69 |
| Bricklayer | $ 20.07 | $ 20.07 | $ - | $ 20.07 |
| Carpenter | $ 20.75 | $ 20.75 | $ 7.30 | $ 28.05 |
| Carpenter (Acoustical Ceiling Installation only) | $ 14.00 | $ 14.00 | $ - | $ 14.00 |
| Carpenter (Form Work Only) | $ 15.62 | $ 15.62 | $ 0.05 | $ 15.67 |
| Cement Mason/Concrete Finisher | $ 15.71 | $ 15.71 | $ - | $ 15.71 |
| Drywall Finisher/Taper | $ 17.06 | $ 17.06 | $ 4.43 | $ 21.49 |
| Drywall Hanger and Metal Stud Installer | $ 17.47 | $ 17.47 | $ 3.45 | $ 20.92 |
| Electrical Installer (Sound and Communication Systems, Excluding Wiring) | $ 18.00 | $ 18.00 | $ 2.30 | $ 20.30 |
| Electrician (Excludes Installation of Sound and Communication Systems) | $ 27.15 | $ 27.15 | $ 7.88 | $ 35.03 |
| Elevator Mechanic <5 years experience | $ 37.76 | $ 37.76 | $ 32.25 | $ 70.01 |
| Elevator Mechanic >5 years experience | $ 37.76 | $ 37.76 | $ 33.01 | $ 70.77 |
| Floor Layer (Carpet) | $ 21.88 | $ 21.88 | $ - | $ 21.88 |
| Glazier | $ 12.83 | $ 13.03 | $ - | $ 13.03 |
| HVAC Mechanic (HVAC Unit Installation Only) | $ 23.78 | $ 23.78 | $ 6.89 | $ 30.67 |
| Ironworker, Ornamental | $ 23.02 | $ 23.02 | $ 6.35 | $ 29.37 |
| Ironworker, Reinforcing | $ 12.27 | $ 13.03 | $ - | $ 13.03 |
| Ironworker, Structural | $ 20.73 | $ 20.73 | $ 5.24 | $ 25.97 |
| *Lead Paint or Asbestos Abatement Worker | * | $ 13.03 | $ - | $ 13.03 |
| Laborer, Common or General | $ 11.44 | $ 13.03 | $ - | $ 13.03 |
| Laborer, Mason Tender - Brick | $ 12.22 | $ 13.03 | $ - | $ 13.03 |
| Laborer, Mason Tender - Cement/Concrete | $ 11.85 | $ 13.03 | $ - | $ 13.03 |
| Laborer, Pipelayer | $ 12.45 | $ 13.03 | $ - | $ 13.03 |
| Laborer, Roof Tearoff | $ 11.28 | $ 13.03 | $ - | $ 13.03 |

| | | | | |
|---|---|---|---|---|
| Operator, Backhoe/Excavator/Trackhoe | $ 19.43 | $ 19.43 | $ 3.49 | $ 22.92 |
| Operator, Bobcat/Skid Steer/Skid Loader | $ 13.00 | $ 13.03 | $ - | $ 13.03 |
| Operator, Bulldozer | $ 14.00 | $ 14.00 | $ - | $ 14.00 |
| Operator, Crane | $ 34.85 | $ 34.85 | $ 9.85 | $ 44.70 |
| Operator, Drill | $ 14.50 | $ 14.50 | $ - | $ 14.50 |
| Operator, Forklift | $ 16.64 | $ 16.64 | $ 6.26 | $ 22.90 |
| Operator, Grader/Blade | $ 19.30 | $ 19.30 | $ - | $ 19.30 |
| Operator, Loader | $ 14.00 | $ 14.00 | $ - | $ 14.00 |
| Operator, Mechanic | $ 18.75 | $ 18.75 | $ 5.12 | $ 23.87 |
| Operator, Paver (Asphalt, Aggregate, and Concrete) | $ 16.03 | $ 16.03 | $ - | $ 16.03 |
| Operator, Roller | $ 11.25 | $ 13.03 | $ - | $ 13.03 |
| Painter (Brush, Roller, and Spray, Excludes Drywall Finishing/Taping) | $ 18.76 | $ 18.76 | $ 6.35 | $ 25.11 |
| Pipefitter (Including HVAC Pipe Installation) | $ 28.03 | $ 28.03 | $ 12.43 | $ 40.46 |
| Plumber, Excludes HVAC Pipe Installation | $ 23.57 | $ 23.57 | $ 6.37 | $ 29.94 |
| Roofer | $ 12.00 | $ 13.03 | $ - | $ 13.03 |
| *Roofer, Metal | $ 14.05 | $ 14.05 | $ - | $ 14.05 |
| Sheet Metal Worker (Including HVAC Duct Installation) | $ 24.38 | $ 24.38 | $ 13.74 | $ 38.12 |
| Sprinkler Fitter (Fire Sprinklers) | $ 27.43 | $ 27.43 | $ 22.52 | $ 49.95 |
| Tile Finisher | $ 11.32 | $ 13.03 | $ - | $ 13.03 |
| Tile Setter | $ 16.35 | $ 16.35 | $ - | $ 16.35 |
| Truck Driver, Dump Truck | $ 12.39 | $ 13.03 | $ 1.18 | $ 14.21 |
| Truck Driver, Flatbed Truck | $ 19.65 | $ 19.65 | $ 8.57 | $ 28.22 |
| Truck Driver, Semi-Trailer Truck | $ 12.50 | $ 13.03 | $ - | $ 13.03 |
| Truck Driver, Water Truck | $ 12.00 | $ 13.03 | $ 4.11 | $ 17.14 |
| Waterproofer | $ 16.30 | $ 16.30 | $ 0.06 | $ 16.36 |

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 TX160323 or other sources.**

1. **Additional Trade information:**

Electricians** - Including low voltage wiring for computers, fire/smoke alarms.
Elevator Mechanics*** - also must be paid for 7 holidays - New Years 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 requires that construction workers are paid a Minimum Wage of at least $13.03/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.

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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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)).

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In the listing above, the "SU" designation means that rates listed under the identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

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WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* 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.

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 Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) 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.

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

4.) All decisions by the Administrative Review Board are final.

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# WAGE RATE DETERMINATION

## HEAVY AND HIGHWAY CONSTRUCTION

COUNTY NAME: TRAVIS

Wages based on DOL General Decision:TX160016 1/8/2016 TX16 and City of Austin Ordinance #20160324-015

*DOL Rate column is for information only. The Total Minimum Wage Rate is derived from the Adjusted Wage Rate Required pursuant to City Ordinance, and can be met using any combination of cash and non-cash qualified fringe benefits, provided the cash component is at least $13.03/hour.*

| CLASSIFICATION | DOL RATE for info only | ADJUSTED WAGE RATE REQUIRED pursuant to City Ordinance | TOTAL MINIMUM WAGE RATE REQUIRED |
|---|---|---|---|
| Agricultural Tractor Operator | $ 12.69 | $ 13.03 | $ 13.03 |
| Asphalt Distributor Operator | $ 15.55 | $ 15.55 | $ 15.55 |
| Asphalt Paving Machine Operator | $ 14.36 | $ 14.36 | $ 14.36 |
| Asphalt Raker | $ 12.12 | $ 13.03 | $ 13.03 |
| Boom Truck Operator | $ 18.36 | $ 18.36 | $ 18.36 |
| Broom or Sweeper Operator | $ 11.04 | $ 13.03 | $ 13.03 |
| Cement Mason/Concrete Finisher | $ 12.56 | $ 13.03 | $ 13.03 |
| Concrete Pavement Finishing Machine Operator | $ 15.48 | $ 15.48 | $ 15.48 |
| Crane, Hydraulic, 80 tons or less | $ 18.36 | $ 18.36 | $ 18.36 |
| Crane, Lattice Boom, 80 tons or less | $ 15.87 | $ 15.87 | $ 15.87 |
| Crane, Lattice Boom, over 80 tons | $ 19.38 | $ 19.38 | $ 19.38 |
| Crawler Tractor | $ 15.67 | $ 15.67 | $ 15.67 |
| Directional Drilling Locator | $ 11.67 | $ 13.03 | $ 13.03 |
| Directional Drilling Operator | $ 17.24 | $ 17.24 | $ 17.24 |
| Electrician | $ 26.35 | $ 26.35 | $ 26.35 |
| Excavator 50,000 lbs. or less | $ 12.88 | $ 13.03 | $ 13.03 |
| Excavator, over 50,000 lbs. | $ 17.71 | $ 17.71 | $ 17.71 |
| Flagger | $ 10.15 | $ 13.03 | $ 13.03 |
| Form Builder/Form Setter - Paving & Curb | $ 12.94 | $ 13.03 | $ 13.03 |
| Form Builder/Form Setter - Structures | $ 12.87 | $ 13.03 | $ 13.03 |
| Foundation Drill Operator, Truck Mounted | $ 16.93 | $ 16.93 | $ 16.93 |
| Front End Loader Operator, 3CY or less | $ 13.04 | $ 13.04 | $ 13.04 |
| Front End Loader, over 3CY | $ 13.21 | $ 13.21 | $ 13.21 |
| Laborer, Common | $ 10.50 | $ 13.03 | $ 13.03 |
| Laborer, Utility | $ 12.27 | $ 13.03 | $ 13.03 |
| Loader/Backhoe Operator | $ 14.12 | $ 14.12 | $ 14.12 |
| Mechanic | $ 17.10 | $ 17.10 | $ 17.10 |
| Milling Machine | $ 14.18 | $ 14.18 | $ 14.18 |
| Motor Grader Operator - Fine Grade | $ 18.51 | $ 18.51 | $ 18.51 |
| Motor Grader Operator, Rough | $ 14.63 | $ 14.63 | $ 14.63 |

| | | | |
|---|---|---|---|
| Painter - Structures | $ 18.34 | $ 18.34 | $ 18.34 |
| Pavement Marking Machine Operator | $ 19.17 | $ 19.17 | $ 19.17 |
| Pipelayer | $ 12.79 | $ 13.03 | $ 13.03 |
| Reclaimer/Pulverizer | $ 12.88 | $ 13.03 | $ 13.03 |
| Reinforcing Steel Setter | $ 14.00 | $ 14.00 | $ 14.00 |
| Roller Operator, Asphalt | $ 12.78 | $ 13.03 | $ 13.03 |
| Roller Operator, Other | $ 10.50 | $ 13.03 | $ 13.03 |
| Scraper Operator | $ 12.27 | $ 13.03 | $ 13.03 |
| Servicer | $ 14.51 | $ 14.51 | $ 14.51 |
| Spreader Box Operator | $ 14.04 | $ 14.04 | $ 14.04 |
| Structural Steel Worker | $ 19.29 | $ 19.29 | $ 19.29 |
| Traffic Signal Installer/Light Pole Worker | $ 16.00 | $ 16.00 | $ 16.00 |
| Trenching Machine Operator, Heavy | $ 18.48 | $ 18.48 | $ 18.48 |
| Truck Drick Tandem Axle Semi-Trailer | $ 12.81 | $ 13.03 | $ 13.03 |
| Truck Driver, Lowboy/Float | $ 15.66 | $ 15.66 | $ 15.66 |
| Truck Driver, Single Axle | $ 11.79 | $ 13.03 | $ 13.03 |
| Truck Driver, Off Road Hauler | $ 11.88 | $ 13.03 | $ 13.03 |
| Truck Driver, Single or Tandem Axle Dump Truck | $ 11.68 | $ 13.03 | $ 13.03 |
| Welder | $ 15.97 | $ 15.97 | $ 15.97 |
| Work Zone Barricade Servicer | $ 11.85 | $ 13.03 | $ 13.03 |

http://www.wdol.gov/wdol/scafiles/davisbacon/tx.html

**The Wage Compliance information detailed below was excerpted from DOL General Decision TX160016 or other sources.**

**1. Additional Trade information:**

Unlisted classifications needed for work not listed within the scope of the classifications listed may be added upon the advance approval of Contract Procurement. CONTRACTOR shall submit to City of Austin Contract Procurement the following: 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. Proposed trade may not be performed by any trade already listed.

## 2. Wages

The Total Minimum Wage Rate may be met by any combination of cash wages and credible "bona fide" fringe benefits paid for by the employer. Overtime must be used in computing overtime pay.wages must be calculated using the Total Minimum Wage Rate specified in the Wage Rate Determination or the actual basic rate of pay, whichever is higher.

City of Austin Ordinance No. 2016324-015 requires that construction workers are paid a minimum Wage of at least $13.03/hour. The cash portion of their compensation must meet or exceed this amount.

**3. Proper Designation of Trade**

A work classification from the Prevailing Wage Poster for each worker must be made based on the actual type of work he/she performed on the job. In summary the work performed, not the "title" determines the correct worker classification and wage. Each worker must be paid no less than the adjusted wage rate on the wage decision for that classification **regardless** of his/her level of skill (exclusive of a bona fide apprentice currently registered in a DOL approved apprentice program - proof of individual registration must be supplied in advance to the City of Austin).

**4. Split Classification**

If a firm has employees that perform work in more than one classification, it can pay the adjusted 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 adjusted 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.

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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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)).

---

In the listing above, the "SU" designation means that rates listed under the identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

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WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* 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.

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 Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) 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.

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

4.) All decisions by the Administrative Review Board are final.

==========

*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.*

**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, dated _(*first advertisement date should go here)*_, _____. 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

**END**

SAMPLE

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The Work of this Contract includes sustainability requirements as shown in the Division 1 Sections 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 "South Austin Regional Wastewater Treatment Plant Thickener Improvements Project", City of Austin Capital Improvement Project No. 3333-016, in its entirety as shown on the Drawings and as specified herein. The work includes, but is not necessarily limited to the following:

1. Erosion and sedimentation controls and tree protection
2. Site Preparation
3. Gravity Thickeners
    a. Replace mechanisms and scum collection systems for each existing thickener
    b. Reconstruct effluent boxes
    c. Replace concrete stairs with aluminum stairs
    d. Replace existing door
    e. Construct new concrete scum wetwells
    f. Recoat interior of thickener launder troughs
    g. Install associated controls
4. Thickened Sludge Pumps

    a. Replace and improve suction and discharge headers and piping for six existing thickened sludge pumps
    b. Install associated piping accessories, valving, and controls
5. Thickener Scum Pumps
    a. Install one submersible, chopper scum pump at each thickener scum wet well
    b. Install scum piping, as wells as associated piping accessories, valving, and controls
6. Electrical Room
    a. Provide new roofing and doors for existing electrical room
    b. Install new electrical equipment and accessories
    c. Install new HVAC system
7. Sludge Holding Tank
    a. Replace existing roof hatch and install a second roof hatch to existing tank cover
    b. Recoat interior of the existing tank
8. Sludge Blending Tanks
    a. Replace roof hatches, railings and access stairs.
9. Odor Control System
    a. Install two bioscrubber systems with access ladders and guardrails.
    b. Connect existing ductwork to new odor control systems, and install new ductwork as required
    c. Connect NPW supply lines to existing piping
    d. Connect bioscrubber drains to existing thickener supernatant line
    e. Install appropriate pipe and duct accessories, valving, and controls
10. Yard Piping and Valves
    a. Install scum yard piping either by sliplining existing scum lines or replacing existing scum lines in place,
11. Electrical
    a. Route new ductbanks and abandon existing ductbanks in place
12. Instrumentation and SCADA
13. Site work
    a. Perform revegetation
14. Roads
    a. Repave plant roads as required
15. Site Lighting
    a. Install new site lighting
16. Furnish trailer-mounted valve operator system

## 1.22 Location of Project

A. The Project is located at the South Austin Regional Wastewater Treatment Plant: 1017 Fallwell Lane in Del Valle, Texas. The project location/route is shown on the Drawings.

## 1.23 Work Sequence

A. Perform Work in sequence listed below to ensure completion of the Work in the Contract Time. Completion dates if the various stages shall be in accordance with the approved construction schedule submitted by the CONTRACTOR. To maintain plant operations, work on the gravity thickeners must be split in two phases, with Phase 1 including the work associated with the North thickeners (2A and 2B) and corresponding three thickened sludge pumps, and Phase 2 including work associated with the South thickeners (1A and 1B) and corresponding three thickened sludge pumps. Items No. 4, No. 7 and No. 8, below may be performed independently from the work associated with the gravity thickeners.

1. Site Preparation
    a. Install erosion and sedimentation controls.
    b. Implement tree protection plan.

c. Prepare site for construction, including site access ways.

2. North Gravity Thickener Systems (Phase 1)
   a. The North Gravity Thickener System consists of GT 2A, GT 2B, Thickened Sludge Pumps No. 4, 5 and 6, and associated components.
   b. GT 2A and GT 2B
      i. Coordinate with OWNER to take offline and drain GT 2B. GT 2A is already out of service.
      ii. Remove top hexagon of thickener domes by removing six center struts, as shown on the Drawings. Do not, under any circumstance remove the center hexagonal ring.
      iii. Remove existing mechanism, walkway, and scum collection system either through existing entry way or through hexagonal opening.
      iv. Install new mechanism, walkway, and scum collection system either through entry way or through top hexagonal opening. Assemble parts beneath thickener dome structure as required.
      v. Coordinate with manufacturer for thickener, walkway, and scum collection system installation.
      vi. Perform remaining improvements to thickener as shown on the Drawings and specified herein, including reconstruction of effluent box, construction of scum wet well, and stair and door replacement.
      vii. Test thickeners and make ready for operation. GT 2A and GT 2B will be put into operation before GT 1A and 1B are taken offline.
   c. Scum Pump Stations and Piping
      i. Install scum pumps, discharge piping, valves, and controls associated with GT 2A and GT 2B.
      ii. Install scum pipe lines to Sludge Transfer Building either by sliplining existing scum lines or by replacing existing scum lines in place.
      iii. Test and make ready for operation scum pumps and piping.
   d. Thickened Sludge Pumps
      i. Work associated with Thickened Sludge Pump No. 4, 5 and 6 will be performed in conjunction with the replacement of GT 2A and GT 2B.
      ii. Demolish piping for Thickened Sludge Pump No. 4, 5, and 6
      iii. Install new suction and discharge piping, piping accessories, valves, and controls for Thickened Sludge Pump 4, 5, and 6.
3. South Gravity Thickener Systems (Phase 2)
   a. The South Gravity Thickener System consists of GT 1A, GT 1B, Thickened Sludge Pumps No. 1, 2 and 3, and associated components.
   b. GT 1A and GT 1B
      i. Coordinate with OWNER to take offline and drain GT 1B and 1A.
      ii. Remove top hexagon of thickener domes by removing six center struts, as shown on the Drawings. Do not, under any circumstance remove the center hexagonal ring.
      iii. Remove existing mechanism, walkway, and scum collection system either through existing entry way or through hexagonal opening.
      iv. Install new mechanism, walkway, and scum collection system either through entry way or through top hexagonal opening. Assemble parts beneath thickener dome structure as required.
      v. Coordinate with manufacturer for thickener, walkway, and scum collection system installation.
      vi. Perform remaining improvements to thickener as shown on the Drawings and specified herein, including reconstruction of effluent box, construction of scum wet well, and stair replacement.
      vii. Test thickeners and make ready for operation.
   c. Scum Pump Stations and Piping
      i. Install scum pumps, discharge piping, valves, and controls associated with GT 1A and GT 1B.

ii. Install scum pipe lines to Sludge Transfer Building either by sliplining existing scum lines or by replacing existing scum lines in place.
iii. Test and make ready for operation scum pumps and piping.

d. Thickened Sludge Pumps
i. Work associated with Thickened Sludge Pump No. 1, 2 and 3 will be performed in conjunction with the replacement of GT 2A and GT 2B.
ii. Demolish piping for Thickened Sludge Pump No. 1, 2, and 3
iii. Install new suction and discharge piping, piping accessories, valves, and controls for Thickened Sludge Pump 1, 2, and 3.

4. Odor Control Systems
a. Odor Control System No. 1
i. Remove existing odor control system
ii. Install Odor Control System No. 1 as shown on the Drawings and as specified herein.
iii. Test and make ready for operation Odor Control System No. 1.
iv. Put odor control systems in operation to develop microbial populations.

b. Odor Control System No. 2
i. Perform for Odor Control System No. 2, the steps above for Odor Control System No. 1.

5. Yard Piping
a. Yard piping associated with GT 2A and GT 2B shall be completed in conjunction with work performed for these thickeners.
b. Yard piping associated with GT 1A and GT 1B shall be completed in conjunction with work performed for these thickeners.

6. Electrical
a. Electrical and I&C improvements associated with GT 2A and GT 2B shall be completed in conjunction with work performed for these thickeners.
b. Electrical and I&C improvements associated with GT 1A and GT 1B shall be completed in conjunction with work performed for these thickeners.
c. Perform Electrical Room improvements while still maintaining existing controls for existing and operating equipment.

7. Sludge Holding Tank
a. Replace existing hatch and add new hatches to top of holding tank.

8. Blending Tank No. 1 and No. 2
a. Replace existing stairs and guardrail

## 1.24 Contractor's Responsibilities

A. Execute all Work, including but not limited to installation of erosion and sedimentation controls, site preparation, gravity thickener rehabilitation and associated solids thickening improvements, as shown on the Drawings and specified herein. 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.

## 1.25 Operation of 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. 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.

B. 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

A. 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.

B. 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

A. 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.

**End**

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For this Project all referenced City of Austin Standard Specifications and Special Specification Items are hereby amended with respect to the clause cited below. No other clauses or requirements of these Items are waived or changed hereby.

In all Special Specifications, insert a Section titled "Measurement and Payment", with the following paragraph:

**"All work items installed, provided, constructed, etc. under this specification shall not be paid for separately but shall be considered subsidiary to the lump sum bid price for the project. No separate pay will be provided for any work governed by this specification. 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."**

END

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# SECTION 01028
# SCHEDULE OF VALUES

## PART 1 GENERAL

### 1.01 SCOPE OF WORK

A. Within ten (10) Calendar Days after award of Contract, the Contractor shall submit to the Owner and Engineer a tentative schedule of values (a detailed breakdown of the bid) for the purpose of developing a Schedule of Values, which in turn shall be used to determine partial payment estimates and may be used to verify costs of credits, change orders, etc.

1. The tentative schedule of values will be reviewed by the Owner and Engineer to determine whether, in his judgment, it is sufficiently detailed for the purpose intended. The Owner and Engineer will also evaluate the schedule to determine whether, in his judgment, the prices included are "unbalanced" or "front-end loaded", in an effort to inflate the prices of those items of Work to be completed in the early stages of the Work.

2. The Owner and Engineer will provide the Contractor with his comments and may request additional information from the Contractor to justify certain item quantities and prices. On the basis of the Owner's and Engineer's comments, the Contractor shall revise and resubmit the tentative schedule of values for further review and approval.

3. Once the tentative schedule of values is approved by the Owner and Engineer, it shall become the Schedule of Values to be used in determining partial payment estimates, and may be used to verify costs of credits, change orders, etc. Five copies of this Schedule shall be submitted to the Owner and Engineer for distribution and his use.

4. No partial payment request (including the first) will be approved until the Schedule of Values has been approved by the Owner and Engineer.

B. In so far as possible, total quantities and unit prices shall be shown for all items of work, separating for each item the materials and labor and such other sub-items as the Contractor may desire. "Lump sum", "miscellaneous", and other such general entries in the schedule shall be avoided whenever possible.

C. Such items as Bond premiums, temporary facilities, and equipment storage should be listed separately in the Schedule of Values, provided the costs can be substantiated. Overhead and profit shall not be listed as separate items.

D. The sum of the prices of the items listed on the Schedule of Values shall equal the Contract Price. No additional payment will be allowed if the quantities shown on the Schedule are less than those actually required to accomplish the Work, unless the quantities are altered by a change order.

E. Each partial payment request by the Contractor shall include the approved Schedule of Values, modified to indicate the total quantity and price of work completed to the date of the request.

F. The approved Schedule of Values will also be used as a guide in determining the value of work involved in change orders.

G. It is the Owner's intent that the Schedule of Values can also be used as a fair and expedient method of deleting items from the Work, should the Owner so desire. Therefore, it is the Contractor's responsibility, as well as to his advantage, to make the schedule as detailed and the items and their corresponding values as equitably determined and presented as possible.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

## PART 1 – GENERAL

### 1.1 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. The CONTRACTOR shall coordinate with the OWNER's Abatement Contractor who will perform the required hazardous material abatement and/or removal, as defined by other CONTRACT DOCUMENTS.

C. Other Work may be performed at site by others during scheduled performance of Work under these Contract Documents.

D. Other Contractors:

1. Other Contractor and Contact Person: To be provided prior to Notice to Proceed or when available.

### 1.2 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.

### 1.3 Project Meetings

A. Reference Section 01200 "Project Meetings".

### 1.4 Other Contracts

A. The OWNER may have other construction contracts being performed simultaneously with this project at the site. Limits of construction and project work area for this contract 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.

B. Abatement of Lead Containing Paint

1. Lead containing paint has been found on gravity thickener equipment.

2. Lead containing paint is present in surfaces that will be required to be disturbed during the scope of work for this project. Any required manual removal of Lead containing paint coated nuts and bolts can be conducted using water based foam to collect any residual resultant dusts/debris. The CONTRACTOR will ensure that their work procedures involving the disturbance of any Lead containing paint are in compliance with the OSHA Lead in construction rule for workers, 29CFR 1926.62. In addition, any Lead containing wastes will be

evaluated and disposed of properly and in compliance with RCRA regulations for hazardous waste characterization and management.

C. Asbestos Containing Materials (ACMs)

1. Trace amounts of asbestos containing materials (ACMs) have been found in the insulation in the block walls of Sludge Transfer Building.

2. ACMs encountered in these materials shall be abated as part of the Work of this project. Owner will provide an Abatement Contractor who will perform all asbestos abatement work on this project. Abatement Contractor is already under contract with the Owner to perform this type of work. All work performed by Abatement Contractor will be in accordance with specifications already accepted by the Owner and Abatement Contractor, attached in Section 01901. The Abatement Contractor will be responsible to the Owner for performing all abatement work and will be compensated directly by the Owner. The Contractor will coordinate work in these areas directly with the Abatement Contractor so that abatement can proceed without incident and in the most efficient manner. Abatement Contractor will be responsible for abatement and disposal or all ACM as required by separate contract with the Owner. Abatement Contractor will provide all tools and equipment required to complete the abatement work.

3. Coordination with Abatement Contractor:

   a. Contractor will work with Abatement Contractor to develop a schedule that will ensure abatement of hazardous materials is completed as the Work of the project progresses in an efficient manner. Coordination of work space will include providing space for the Abatement Contractor to access hazardous materials and providing adequate room for the construction of required containments as required for the removal of ACM.

   b. Drilling or cutting penetrations through Block Wall: Abatement Contractor will remove insulation fill from the hollow cavities within the block wall. Sleeves, provided by the Contractor as part of the Work, will be installed by the Abatement Contractor.

## 1.5 Operation of and Connection to Existing Facilities

A. Existing water and wastewater facilities shall be kept in continuous operation throughout the construction period, unless otherwise specified herein. 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.

D. The CONTRACTOR is to submit a construction plan and schedule, which details the methods, means, techniques, and sequences to be used to establish a base element of surety against a wastewater spill, to the ENGINEER for review and approval by the OWNER at least two weeks prior to any connections to existing pipes or structures. Such plan is to provide assurance against a wastewater spin, with at least one level of

backup. Any and all fines or fees imposed upon the OWNER resulting from spills or process interruptions to be assessed solely upon CONTRACTOR. One week prior to connections being made to existing structures or pipes, a coordination meeting is to be held between the CONTRACTOR, ENGINEER, and OWNER to discuss the construction plan previously submitted by the CONTRACTOR.

E. Schedule of construction, interconnecting details, and other revisions necessary for proper interfacing of the Work to be subsequently modified by CONTRACTOR accounting for results of said coordination meeting. The ENGINEER and OWNER are to be notified 24 hours prior to any actual interruptions or connections being made. Begin no work prior to securing OWNER's approval of respective connection plan and work schedule.

### 1.6 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.

### 1.7 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. Allow access for OWNER's personnel.

### 1.8 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

### 3.1 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.

8. Refer to Section 01045 for additional requirements.

### 3.2 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**

# SECTION 01045
# CUTTING AND PATCHING

## PART 1 GENERAL

### 1.01 SCOPE OF WORK

A. This Section covers the cutting, coring, rough and finished patching of holes and openings Holes and opening maybe in existing construction, or in parts of new construction. Procedures for cutting and patching will be the same for either condition.

B. All cutting, coring, and rough patching shall be performed by the Contractor, unless otherwise specified in the Contract Documents. Finish patching shall be the responsibility of the Contractor and shall be performed by the trade associated with the application of the particular finish.

C. It has been determined that the masonry block in the Sludge Transfer Pump Building contains trace amounts of asbestos. An Abatement Contractor, as designated by Owner, shall be utilized for removal of asbestos. Refer to Sections 01040 and 01901.

D. Provide all cutting, fitting and patching, including attendant excavation and backfill, required to complete the work or to:

1. Make its several parts fit together properly.

2. Uncover portions of the work to provide for installation of ill-timed or improperly scheduled work.

3. Remove and replace defective work.

4. Remove and replace work not conforming to requirements of Contract Documents.

5. Remove samples of installed work as specified for testing.

6. Provide penetrations of structural surfaces and materials for installation of piping, ductwork, equipment and electrical conduit.

7. Provide penetrations of non-structural surfaces and materials for installation of piping, ductwork, equipment and electrical conduit. The determination of what is a nonstructural surface or material shall be made by the Engineer.

8. Remove, install, or relocate materials or equipment.

### 1.02 RELATED WORK

A. Summary of Work is included in Section 01010.

B. Concrete is included in Series 400.

C. Site work is included in Division 2.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, a written request prior to executing any cutting or alteration which is not shown or detailed on the contract documents which affects or requires:

1. Cutting structural members.

2. Holes drilled in beams or other structural members.

3. Work of the Owner or any separate contractor.

4. Structural value or integrity of any element of the project.

5. Integrity or effectiveness of weather-exposed or m-oisture-resistant elements or systems.

6. Efficiency, operational life, maintenance or safety of operational elements.

7. Visual qualities of sight-exposed elements.

B. Request shall include:

1. Identification of the project.

2. Description of affected work.

3. The reason for cutting, alteration or excavation.

4. Effect on work of Owner or any separate contractor, or on structural or weatherproof integrity of project.

5. Description of proposed work:
   a. Method and extent of cutting, patching, alteration, or excavation.
   b. Trades who will execute the work.
   c. Products proposed to be used.
   d. Extent of refinishing to be done.

6. Alternatives to cutting and patching.

7. If the work is considered out of scope, provide a cost proposal.

8. Confirmation of coordination with any separate contractor whose work will be affected.

9. Related shutdown requests if required to do the work.

10. Request for hot work permit if required to do the work.

C. Submit written notice to the Engineer designating the date and the time the work will be uncovered.

D. When a written request is required, do not proceed with the work until a written notice to proceed is received from the Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Comply with specifications and standards for each specific product involved. Where there is no equivalent specification, the Contractor shall notify the Engineer who will provide a specification for the materials to be used.

B. Concrete and grout for rough patching shall be as specified in Series 400.

C. Materials for finish patching shall be equal to those of adjacent construction. Where existing materials are no longer available, use materials with equivalent properties and that will provide the same appearance. The materials are to be approved by the Engineer prior to their use.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect existing conditions of project, including elements subject to damage or to movement during cutting and patching.

B. After uncovering work, inspect conditions affecting installation of products, or performance of work.

C. Report unsatisfactory or questionable conditions to the Engineer in writing; do not proceed with work until the Engineer has provided further instructions.

3.02 PREPARATION

A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.

B. Protect surrounding materials and equipment prior to starting work.

C. Contain and control cooling liquids and slurry produced by the cutting and coring operations.

D. When the cutting or coring will result in the structure or equipment being exposed to provide adequate weather protection.

E. Provide dewatering for excavation work in accordance with Section 02140.

3.03 PERFORMANCE

A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.

B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work. When excavating in close proximity to piping, duct banks or other items subject to damage, use hand excavation.

C. All equipment and workplace safety shall conform to OSHA standards and specifications pertaining to plugs, noise and fume pollution, wiring and maintenance.

D. Where possible, employ original installer or fabricator to perform cutting and patching for:

1. Weather-exposed or moisture-resistant elements.

2. Sight-exposed finished surfaces.

E. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.

F. Restore work which has been cut or removed; install new products to provide completed work in accordance with requirements of Contract Documents.

G. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:

1. For continuous surfaces, refinish to nearest intersection.

2. For an assembly, refinish entire unit.

H. Remove rubble and excess patching materials from the premises.

3.04 CORING

A. All coring shall be performed in such a manner as to limit the extent of patching. Locate the rebar before coring to minimize cut troughs.

B. Coring shall be performed with an approved non-impact rotary tool with diamond core drills.

C. Size of holes shall be suitable for pipe, conduit, sleeves, equipment or mechanical seals to be installed.

D. Fit work to minimize space to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

E. Fit to pipes and other penetrations in tanks to be water tight using seals or other methods defined in the specifications.

F. All holes cut through concrete and masonry walls, slabs or arches shall be core drilled unless otherwise approved. All work shall be performed by mechanics skilled in this type of work.

G. If holes are cored through floor slabs they shall be drilled from below where possible. If holes are drilled from above, provide protection and containment below the area being drilled to catch the plug and contain liquid and slurry.

3.05 CUTTING

A. All cutting shall be performed in such a manner as to limit the extent of patching.

B. Fit work to minimize space to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

C. Cutting shall be performed with a concrete saw and diamond saw blades of proper size.

D. Provide for control of slurry generated by sawing operation on both sides of wall and from below if cutting a floor.

E. When cutting a reinforced concrete wall or floor, the cutting shall be done so as not to damage the bond between the concrete and reinforcing steel left in structure. Cut shall be made so that steel neither protrudes nor is recessed from face of the cut.

F. Adequate bracing of area to be cut shall be installed prior to start of cutting. Check area during sawing operations for partial cracking and provide additional bracing as required to prevent a partial release of cut area during sawing operations.

G. Provide equipment of adequate size to remove cut panel.

H. Saw cut concrete and masonry prior to breaking out sections.

I. Install work at such time as to require the minimum amount of cutting and patching.

J. All cutting of structural members shall be done in a manner directed by the Engineer.

K. Cut opening only large enough to allow easy installation of the equipment, ducting, piping or conduit.

L. When existing conduits or pipe sleeves are cut off at the floor line or wall line, they shall be filled with grout or suitable patching material.

3.06 PROTECTION

A. Provide devices and methods to protect other portions of project from damage.

B. Provide protection from elements for that portion of the project which may be exposed by cutting and patching work.

C. Maintain excavations free from water.

3.07 PATCHING

A. Rough patching shall be such as to bring the cut or cored area flush with existing construction unless otherwise shown.

B. Finish patching shall match existing surfaces as approved.

C. Patching shall be of the same kind and quality of material as was removed.

D. The completed patching work shall restore the surface to its original appearance or better.

E. Patching of waterproofed surfaces shall render the area of the patching completely waterproofed to include the joint between the existing material and the patch.

F. Equipment damaged during cutting and patching shall be replaced or repaired by the equipment manufacturer, at the Engineer sole discretion and at the expense of the Contractor doing the work.

G. Repaint any damage to factory applied paint finishes using touch-up paint furnished by the equipment manufacturer. The entire damaged panel or section shall be repainted in accordance with the field painting requirements specified in Section 09902 at the expense of the Contractor doing the work.

H. Slurry or tailings resulting from coring or cutting operations shall be contained and vacuumed or otherwise removed from the area following drilling or cut.

I. Equipment shall be protected against mechanical and water damage during cutting and patching. Provide protective covers or use other means such as temporary relocation to protect equipment that is at risk of damage from the cutting and patching

J. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.

END OF SECTION

# SECTION 01046
# CONTROL OF WORK

## PART 1 GENERAL

### 1.01 PLANT

A. Furnish plant improvements and equipment which will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress which will ensure the completion of the work within the Contract Time. If at any time such improvements appears to be inefficient, inappropriate or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, Engineer may order the Contractor to increase the efficiency, change the character or increase the plant equipment and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his obligations to secure the quality of the work and rate of progress required.

### 1.02 PRIVATE LAND

A. Do not enter or occupy private land outside of easements, except by permission of the land owner.

### 1.03 PIPE LOCATIONS

A. Locate pipelines substantially as indicated on the Drawings. The Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him from laying and jointing different or additional items where required.

### 1.04 OPEN EXCAVATIONS

A. Adequately safeguard all open excavations by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. Provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen, as applicable. Remove bridges provided for access during construction when no longer required. The length or size of excavation will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the Engineer. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Engineer may require special construction procedures such as limiting the length of the open trench, prohibiting stacking excavated material in the street and requiring that the trench shall not remain open overnight.

B. Take precautions to prevent injury to the public due to open trenches. Provide adequate light at all trenches, excavated material, equipment, or other obstacles which could be dangerous to the public at night.

### 1.05 TEST PITS

A. Excavate test pits, at the direction of the Engineer, to locate underground pipelines or structures in advance of the construction. Backfill test pits immediately after their purpose has been satisfied and restore and maintain the surface in a manner satisfactory to the Engineer.

1.06 CARE AND PROTECTION OF PROPERTY

A. Be responsible for the preservation of all public and private property and use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, restore such property to a condition similar or equal to that existing before the damage was done, or make good the damage in other manner acceptable to the Engineer and Owner.

1.07 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

A. Assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including poles, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, sewers, drains and electric and telephone cables, whether or not they are shown on the Drawings. Carefully support and protect all such structures and utilities from injury of any kind. Immediately repair any damage resulting from the construction operations.

B. Assistance will be given the Contractor in determining the location of existing services. The Contractor, however, shall bear full responsibility for obtaining all locations of underground structures and utilities (including existing water services, drain lines and sewers). Maintain services to buildings and pay costs or charges resulting from damage thereto.

C. Notify all utility companies in writing at least 72 hours (excluding Saturdays, Sundays and Legal holidays) before excavating in any public way, if required.

D. If, in the opinion of the Engineer, permanent relocation of a utility owned by the City of Austin is required, the Owner may direct the Contractor, in writing, to perform the work. Work so ordered will be paid for at the Contract unit prices, if applicable, or as extra work. If relocation of a privately owned utility is required, the Owner will notify the Utility to perform the work as expeditiously as possible. Cooperate with the Engineer and Utility. No claim for delay will be allowed due to such relocation.

E. Coordinate the removal and replacement of traffic loops and signals, if required for the performance of the work, at no additional cost to the Owner.

1.08 WATER FOR CONSTRUCTION PURPOSES

A. Refer to City Specification 01500.

1.09 COOPERATION WITHIN THIS CONTRACT

A. All firms or persons authorized to perform any work under this Contract shall cooperate with the Contractor and Subcontractors or trades and assist in incorporating the work of other trades where necessary or required.

B. Cutting and patching, drilling and fitting shall be carried out where required by the trade or subcontractor having jurisdiction, unless otherwise indicated herein or directed by the Engineer.

1.10 CLEANUP AND DISPOSAL OF EXCESS MATERIAL

A. During the course of the work, keep the site of operations as clean and neat as possible. Dispose of all residue resulting from the construction work and, at the conclusion of the work, remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any

other refuse remaining from the construction operations and leave the entire site of the work in a neat and orderly condition.

B. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, comply with all applicable Federal, State and local laws and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and in other related sections.

C. Disposal of excess excavated material in wetlands, stream corridors and plains is strictly prohibited even if the permission of the property owner is obtained. Any violation of this restriction by the Contractor or any person employed by him will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. The Contractor will be required to remove the fill and restore the area impacted at no increase in the Contract Price.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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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 ENGINEER. 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 ENGINEER 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 will be provided by the ENGINEER. 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 **centerline and** offset centerline stakes will be set at no greater than fifty (50) foot intervals **and at points of alignment or grade changes**. 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 his 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, ENGINEER 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 **centerline of the pipe as well as cuts and** 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 he wishes to do work, so that any checking deemed necessary by the OWNER may be done with minimum inconvenience to the ENGINEER 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 himself 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.

9. Upon completion of construction, or at intervals specified in the Contract, CONTRACTOR shall provide a record survey of the work in progress or completed. This information will be submitted to the Owner's Representative and shall be supplied electronically and on a separate full size plan sheet to be transmitted to the ENGINEER for evaluation and merging into the Record Drawings.

**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 |
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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.

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| 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 |

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| 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 |

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| 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 |

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| 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

NCRPMNational 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

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|---|---|
| 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 |

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| 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 |

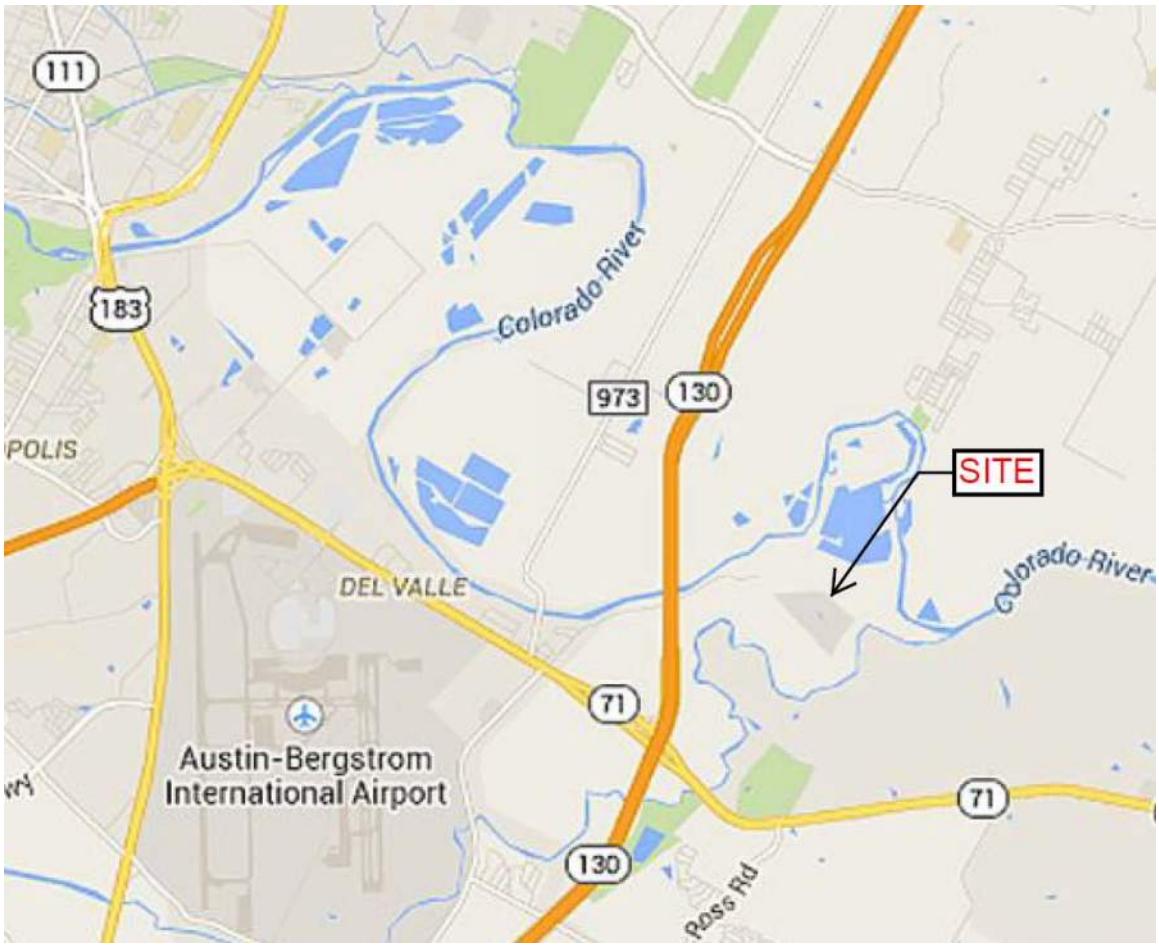
**END**

# STORM WATER POLLUTION PREVENTION PLAN (SWPPP)



The Storm Water Pollution Prevention Plan for this project is attached.

# STORM WATER POLLUTION PREVENTION PLAN
# FOR CONSTRUCTION ACTIVITIES



**PROJECT NAME**
**SOUTH AUSTIN REGIONAL WWTP**
**THICKENER IMPROVEMENT PROJECT**

**SITE PLAN/DEVELOPMENT PERMIT NO.**
**GP-2016-XXXX.AWU**

**PLAN DATE APRIL, 2016**


CAS Consulting & Services, Inc.
TBPE Firm #F-003572

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# SECTION 1: SITE EVALUATION, ASSESSMENT, AND PLANNING

## *1.1 Project/Site Information*

Project/Site Name: SOUTH AUSTIN REGIONAL WWTP THICKENER IMPROVEMENTS PROJECT
Project Street/Location: 1017 Fallwell Lane.
City: Austin State: Texas ZIP Code: 78617
County: Travis
City of Austin Permit Number (complete when assigned):
GP-2016-XXXX.AWU
City of Austin Case Manager (complete when assigned):
O. B. McKown

TPDES project or permit tracking number*:

Latitude: Longitude:
30º 12'30" N, 97 º 36' 19" W

Method for determining latitude/longitude:
____USGS topographic map (specify scale:_____) ____EPA Web site ____GPS
Other (please specify): Google Earth

Is the project located in Indian country? _____Yes __X__No
If yes, name of Reservation, or if not part of a Reservation, indicate "not applicable."

Is this project considered a federal facility? _____Yes ___X_No

TPDES project or permit tracking number*: _____
**(This is the unique identifying number assigned to your project by your permitting authority after you have applied for coverage under the appropriate Texas Pollutant Discharge Elimination System (TPDES) construction general permit.)*

## *1.2 Contact Information/Responsible Parties*

**Owner(s):**
Austin Water Utility
City of Austin, Texas
P.O. Box 1088
Austin, Texas 78767

**Operator(s)*:** *Not applicable for City of Austin permit
N/A

**Project Manager(s) or Site Supervisor(s):**
John Wepryk, P.E.
City of Austin, Public Works Department
505 Barton Springs Rd., Suite 900
Austin, Texas 78704
Phone: (512) 974-7010

**SWPPP Contact(s):**
CAS Consulting and Services, Inc.
7908 Cameron Road
Austin, Texas 78754
Phone: (512) 836-2388
Fax: (512) 836-4515

**This SWPPP was Prepared by:**
CAS Consulting and Services, Inc.
7908 Cameron Road
Austin, Texas 78754
Phone: (512) 836-2388
Fax: (512) 836-4515

**Subcontractor(s)*:** *Not applicable for City of Austin permit
N/A

**Emergency 24-Hour Contact:**
TBD

## *1.3 Soils, Slopes, Vegetation, and Current Drainage Patterns*

Soil type(s): BgA – Bergstrom silty clay loam; LcA – Lewisville silty clay**.**

Slopes (describe current slopes and note any changes due to grading or fill activities):

Slopes range from 0% to 3%

Drainage Patterns (describe current drainage patterns and note any changes dues to grading or fill activities):

Drainage is generally sheet flow with small drainage areas (<1 acre) feeding to bar ditches and then to storm sewer system.
Drainage Patterns will be undisturbed as there are no grading or fill activities proposed.

Vegetation: No vegetation in roadways, mowed grass land with minor landscape plantings.

Other: N/A

## *1.4 Receiving Waters*

Description of receiving waters: Runoff from the site flows into Onion Creek (Stream Segment #1427) and then into the Colorado River (Stream Segment #1428). There are no wetland areas on the site; none classified as US Army Corps of Engineers jurisdictional wetland and none classified as City of Austin jurisdictional wetlands.

Description of storm sewer systems: Roadways in the project area have bar ditches to collect surface runoff and some underground culverts constructed of reinforced concrete pipe (RCP) that terminate in concrete headwalls at nearby open channels.

Description of impaired waters or waters subject to TMDLs: N/A

Other: N/A

## *1.5 Site Features and Sensitive Areas to be Protected*

Describe unique features that are to be preserved: N/A

Describe critical environmental features that are to be preserved: N/A
Describe measures to protect these features: N/A

### *1.6 Endangered Species Certification*

Are endangered or threatened species and critical habitats on or near the project area?
_____Yes __**X**__No

Describe how this determination was made: N/A

If yes, describe the species and/or critical habitat: N/A

If yes, describe or refer to documentation that determines the likelihood of an impact on Identified species and/or habitat and the steps taken to address that impact. (Note, if species are on or near your project site, EPA strongly recommends that the site operator work closely with the appropriate field office of the U.S. Fish and Wildlife Service or National Marine Fisheries Service. For concerns related to state or tribal listing of species, please contact a state or tribal official.)

### *1.7 Maps and Photographs*

See construction plan sheets.

## SECTION 2: CONSTRUCTION ACTIVITIES AND SITE MANAGEMENT PRACTICES

### *2.1 Nature and Sequence of Construction Activity*

Describe the general scope of the work for the project, major phases of construction, etc:

The project includes replacing the gravity thickener mechanisms, piping modifications to the pump building, replacing the odor control units including removing and replacing the concrete slab foundations, and associated yard piping and electrical duct banks. Additionally, 840 SF of concrete sidewalk and 400 SF of driveway will be removed and replaced. No portion of this project is located within the 100-year flood plain per Federal Emergency Management Agency Flood Insurance Rate Map Community Panel 48453CO630 J, dated August 18, 2014. Environmental and sedimentation controls will be installed and maintained by the contractor as required.

Sequence of Construction: 1. Install temporary erosion/sedimentation controls. 2. Install stabilized construction entrances. 3. Construct project. 4. Restore and revegetate disturbed areas. 5. Remove temporary erosion/controls after revegetation is established.

What is the function of the construction activity?
___Residential ___ Commercial _X_ Industrial __ Road Construction ___ Linear Utility
__Other (please specify):

Estimated Project Start Date: September 2016
Estimated Project Completion Date: December 2018

## *2.2 Construction Site Estimates*

The following are estimates of the construction site.

| | | |
|---|---|---|
| Total project area: | 8.2 | acres |
| Construction site area to be disturbed: | 2.1 | acres |
| Limits of construction: | 8.2 | acres |
| Percentage impervious area before construction: | 35 | % |
| Runoff coefficient before construction (C25): | 0.55 | |
| Percentage impervious area after construction: | 36 | % |
| Runoff coefficient after construction (C25): | 0.56 | |

Cut/Fill Volumes per Phase: N/A

Demonstration of how spoils will be handled during construction:

Spoils will be stored in a designated temporary spoils area within the site. Silt fences will be installed down-gradient from the spoils area. Spoils will be hauled to a COA-approved landfill for permanent disposal.

## *2.3 Phasing and Construction Sequence Plan*

No Phasing

## *2.4 Potential Sources of Pollution*

Potential sources of sediment to stormwater runoff:
Potential sources of pollution which may affect the quality of storm water discharges from the construction site include silt and sediments from excavation and temporary spoils piles, oil leaking from construction equipment and litter from materials packaging opened on-site. To prevent pollution of the storm water discharges from the construction site, erosion/sedimentation controls have been specified in compliance with the City of Austin's Environmental Criteria Manual. Stabilized construction entrances will be installed to prevent trucks from tracking dirt onto the plant streets. Silt fences will be installed down gradient of all surface construction areas to filter sheet flow runoff.

Contractor will promptly remove any sediment that collects in the project area and repair any erosion controls that get damaged. Oil leaks will be immediately contained with absorbent materials. All disturbed areas will be revegetated upon completion of the project.

Potential pollutants and sources, other than sediment, to stormwater runoff: N/A

| Trade Name Material | Stormwater Pollutants | Location |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

# SECTION 3: GRADING AND EROSION/SEDIMENT CONTROL BMPs

## *3.1 Minimize Disturbed Area and Protect Natural Features and Soil*

Prior to starting construction, chain link tree protection fencing will be installed at the critical root zone of trees within the project area to minimize the disturbed area. To prevent pollution of the storm water discharges from the construction site, erosion/sedimentation controls have been specified in compliance with the City of Austin's Environmental Criteria Manual. Stabilized construction entrances will be installed to prevent trucks from tracking dirt onto the plant streets. Silt fences will be installed down gradient of all surface construction areas to filter sheet flow runoff. Contractor will promptly remove any sediment that collects in the project area and repair any erosion controls that get damaged.

All disturbed areas will be revegetated upon completion of the project. Contractor shall water all seeded or sodded areas twice per week a minimum of 5 gallons of water per square yard to insure growth of vegetation. Watering shall continue until grass has reached a height of 1 ½" with 95% coverage and no bare patches greater than 16 s.f.

### *3.2 Control Stormwater Flowing onto and through the Project*

Silt fence and/or mulch socks will be installed near the perimeter of all disturbed areas to intercept sediment and will remain in place until the disturbed are is permanently stabilized.

| | |
|---|---|
| ***BMP Description***: | ***Silt Fence/ Mulch Socks*** |
| ***Installation Schedule***: | ***Prior to any site disturbance*** |
| ***Maintenance and Inspection***: | ***Contractor*** |
| ***Responsible Staff***: | ***Contractor*** |

### *3.3 Stabilize Soils: N/A*

### *3.4 Protect Slopes: N/A*

### *3.5 Protect Storm Drain Inlets: N/A*

### *3.6 Establish Perimeter Controls and Sediment Barriers*

Silt fence and/or mulch socks will be installed near the perimeter of all disturbed areas to intercept sediment and will remain in place until the disturbed area is permanently stabilized. Rock Berms will be installed in bar ditches where flow is concentrated where exiting the site.

| | |
|---|---|
| ***BMP Description***: | ***Silt Fence/ Mulch Socks/ Rock Berms*** |
| ***Installation Schedule***: | ***Prior to any site disturbance*** |
| ***Maintenance and Inspection***: | ***Contractor*** |
| ***Responsible Staff***: | ***Contractor*** |

### *3.7 Retain Sediment On-Site: N/A*

### *3.8 Establish Stabilized Construction Exits*

A stabilized pad of crushed stone will be installed at all points of construction ingress and egress.

| | |
|---|---|
| ***BMP Description***: | ***12'x50' Stabilized Construction Exits*** |
| ***Installation Schedule***: | ***Prior to any site disturbance*** |
| ***Maintenance and Inspection***: | ***Contractor*** |
| ***Responsible Staff***: | ***Contractor*** |

### *3.9 Additional BMPs: N/A*

# SECTION 4: GOOD HOUSEKEEPING BMPs

An effort will be made to store only enough products required to do the job. All materials stored on-site will be stored in a neat, orderly manner in their appropriate containers and, if possible, in an enclosure. Products will be kept in their original containers with the original manufacturer's labels. Substances will not be mixed with one another unless recommended by the manufacturer. Whenever possible, all of a product will be used before disposing of the container. Manufacturers' recommendations for proper use and disposal will be followed. The contractor will inspect daily to assure proper use and disposal of materials on-site. Contractor shall advise Owner immediately, verbally and in writing, of any fuel or toxic material spill and the actions taken to remedy the problem. Contractor is responsible for disposing fuels, materials and contaminated excavated materials in a legally approved manner. Contractor is responsible for complying with all applicable environmental laws. All waste materials will be collected and stored in a securely lidded metal dumpster. The dumpster will meet all local and state solid waste management regulations. All trash and construction debris from the site will be deposited in the dumpster and hauled to an approved landfill. No construction waste material will be buried on-site. All personnel will be instructed regarding the correct procedure for waste disposal. The contractor who manages the day-to-day site operations will be responsible for seeing that these procedures are followed. No hazardous waste is expected to be generated or encountered in this project. In the event that hazardous waste is encountered, the contractor will advise the Owner immediately. All hazardous waste materials will be disposed of in a manner specified by local or state regulation or by the manufacturer. The contractor who manages day-today site operations will be responsible for assuring that these practices are followed for any hazardous waste that is generated. Contractor will not aggravate any hazardous waste that is encountered. All sanitary waste will be regularly collected from the portable units by a licensed sanitary waste management contractor. The stabilized construction entrances are to be used by vehicles leaving the site to capture mud before it is tracked onto the existing streets. The paved streets adjacent to the site entrances will be cleaned (not flushed) as needed to remove any excess mud, dirt or rock tracked from the site. It shall be the contractor's continuous responsibility at all times, including nights, holidays and weekends until acceptance of the project by the City, to maintain the specified areas relatively free of dust by sprinkling in a manner what will cause the least inconvenience to the public.

## *4.1 Material Handling and Waste Management*

*Waste Materials* - All trash and debris will be collected and stored in dumpsters meeting all local and state solid waste management regulations prior to removal from site. The trash and debris will be hauled to an approved landfill site and no construction debris will be buried on site.

*Sanitary Waste* - Contractor is responsible for providing adequately maintained sanitary facilities.

## Description

Building materials and other construction site wastes must be properly managed and disposed of to reduce the risk of pollution from materials such as surplus or refuse building materials or hazardous wastes. Practices such as trash disposal, recycling, proper material handling, and spill prevention and cleanup measures can reduce the potential for stormwater runoff to mobilize construction site wastes and contaminate surface or ground water.

## Applicability

The proper management and disposal of wastes should be practiced at every construction site to reduce stormwater runoff. Use waste management practices to properly locate refuse piles, to cover materials that might be displaced by rainfall or stormwater runoff, and to prevent spills and leaks from hazardous materials that were improperly stored.

## Siting and Design Considerations

*Solid Wastes*:

- Designate a waste collection area on the site that does not receive a substantial amount of runoff from upland areas and does not drain directly to a water body.
- Ensure that containers have lids so they can be covered before periods of rain, and keep containers in a covered area whenever possible.
- Schedule waste collection to prevent the containers from overfilling.
- Clean up spills immediately. For hazardous materials, follow cleanup instructions on the package. Use an absorbent material such as sawdust or kitty litter to contain the spill.
- During the demolition phase of construction, provide extra containers and schedule more frequent pickups.
- Collect, remove, and dispose of all construction site wastes at authorized disposal areas. Contact a local environmental agency to identify these disposal sites.

*Hazardous Materials and Wastes*:

- Consult with local waste management authorities about the requirements for disposing of hazardous materials.
- To prevent leaks, empty and clean hazardous waste containers before disposing of them.
- Never remove the original product label from the container because it contains important safety information. Follow the manufacturer's recommended method of disposal, which should be printed on the label.
- Never mix excess products when disposing of them, unless specifically recommended by the manufacturer.

To ensure the proper disposal of contaminated soils that have been exposed to and still contain hazardous substances, consult with state or local solid waste regulatory agencies or private firms. Some landfills might accept contaminated soils, but they require laboratory tests first.

Paint and dirt are often removed from surfaces by sandblasting. Sandblasting grits are the byproducts of this procedure and consist of the sand used and the paint and dirt particles that are removed from the surface. These materials are considered hazardous if they are removed from older structures because they are more likely to contain lead-, cadmium-, or chrome-based paints. To ensure proper disposal of sandblasting grits, contract with a licensed waste management or transport and disposal firm.

*Pesticides and fertilizers*:

- Follow all federal, state, and local regulations that apply to the use, handling, or disposal of pesticides and fertilizers.
- Do not handle the materials any more than necessary.
- Store pesticides and fertilizers in a dry, covered area.
- Construct berms or dikes to contain stored pesticides and fertilizers in case of spillage.
- Follow the recommended application rates and methods.
- Have equipment and absorbent materials available in storage and application areas to contain and clean up any spills that occur.

*Petroleum Products*:

- Store new and used petroleum products for vehicles in covered areas with berms or dikes in place to contain any spills.
- Immediately contain and clean up any spills with absorbent materials.
- Have equipment available in fuel storage areas and in vehicles to contain and clean up any spills that occur.

*Detergents*:

Phosphorous- and nitrogen-containing detergents are used in wash water for cleaning vehicles. Excesses of these nutrients can be a major source of water pollution. Use detergents only as recommended, and limit their use on the site. Do not dump wash water containing detergents into the storm drain system; direct it to a sanitary sewer or contain it so that it can be treated at a wastewater treatment plant.

**Limitations**

An effective waste management system requires training and signage to promote awareness of the hazards of improper storage, handling, and disposal of wastes. The only way to be sure that waste management practices are being followed is to be aware of

worker habits and to inspect storage areas regularly. Extra management time may be required to ensure that all workers are following the proper procedures.

**Maintenance Considerations**

Inspect storage and use areas and identify containers or equipment that could malfunction and cause leaks or spills. Check equipment and containers for leaks, corrosion, support or foundation failure, or other signs of deterioration, and test them for soundness. Immediately repair or replace any that are found to be defective.

**Effectiveness**

Waste management practices are effective only when they are regularly practiced at a construction site. In storage and use areas, post the guidelines for proper handling, storage, and disposal of construction site wastes; train workers in these practices to ensure that everyone is knowledgeable enough to participate.

**Cost Considerations**

The costs associated with construction site waste management are mainly attributed to purchasing and posting signs, increased management time for oversight, additional labor required for special handling of wastes, transportation costs for waste hauling, and fees charged by disposal facilities to take the wastes.

## *4.2 Establish Proper Building Material Staging Areas*

The following materials are expected to be stored on-site: Pipe, bedding material, grout, steel rebar, concrete forms, lumber, mechanical equipment, electrical cable and metal castings.

## *4.3 Designate Washout Areas: N/A*

## *4.4 Establish Proper Equipment/Vehicle Fueling and Maintenance Practices:*

Fuel will no be stored on-site. Fuel will be delivered to the site as needed for the purpose of refueling.

## *4.5 Control Equipment/Vehicle Washing*

**Description**

Ideally, vehicle maintenance and washing occurs in garages and wash facilities, not on active construction sites. However, if these activities must occur onsite, operators should follow appropriate BMPs to prevent untreated nutrient-enriched wastewater or hazardous wastes from being discharged to surface or ground waters.

## Applicability

Vehicle maintenance and washing BMPs prevent construction site spills of wash water, fuel, or coolant from contaminating surface or ground water. They apply to all construction sites. Appropriate BMPs include the following:

- Using a covered, paved area dedicated to vehicle maintenance and washing
- Ensuring that the areas are properly connected to a storm drain system
- Developing a spill prevention and cleanup plan
- Preventing hazardous chemical leaks by properly maintaining vehicles and equipment
- Properly covering and providing secondary containment for fuel drums and toxic materials
- Properly handling and disposing of vehicle wastes and wash water

## Implementation

Inspect construction vehicles daily, and repair any leaks immediately. Dispose of all used oil, antifreeze, solvents and other automotive-related chemicals according to manufacturer instructions. These wastes require special handling and disposal. Used oil, antifreeze, and some solvents can be recycled at designated facilities, but other chemicals must be disposed of at a hazardous waste disposal site. Local government agencies can help identify such facilities.

Designate special paved areas for vehicle repair. To direct wash water to sanitary sewer systems or other treatment facilities, ensure that vehicle-washing areas are impervious and are bermed. Use blowers or vacuums instead of water to remove dry materials from vehicles if possible. Because water alone can remove most dirt adequately, use high-pressure water spray without detergents at vehicle washing areas. If you must use detergents, avoid phosphate- or organic-based cleansers to reduce nutrient enrichment and biological oxygen demand in wastewater. Use only biodegradable products that are free of halogenated solvents. Clearly mark all washing areas, and inform workers that all washing must occur in this area. Do not perform other activities, such as vehicle repairs, in the wash area.

## Limitations

Vehicle maintenance area limitations include connection costs to sanitary sewers; disposal costs for wash water (fees charged by hazardous waste disposal facilities); construction costs for an enclosed maintenance area; and labor costs for hazardous waste storage, handling, and disposal. Depending on the volume of wastewater created and the type of detergents used, vehicle wash areas may also require permits.

## Maintenance Considerations

Vehicle maintenance operations produce substantial amounts of hazardous and other wastes that require regular disposal. Clean up spills and dispose of cleanup materials immediately. Inspect equipment and storage containers regularly to identify leaks or signs of deterioration. Maintenance of vehicle wash areas is minimal, usually involving repairs to berms and drainage to the sanitary sewer system.

**Effectiveness**

These techniques effectively reduce discharges of untreated automotive wastes and wash water to receiving waters. Their effectiveness highly depends on personnel's training and level of commitment to follow procedures.

**Cost Considerations**

Costs associated with vehicle maintenance and wash areas include building enclosed structures, establishing connections to the sanitary sewer system, grading wash areas to drain only to sanitary sewers, and increased labor associated with special handling of hazardous wastes.

## *4.6 Spill Prevention and Control Plan*

The following good housekeeping practices will be followed onsite during the construction project.

1. An effort will be made to store only enough products required to do the job.
2. All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
3. Product will be kept in their original containers with the original manufacturer's label.
4. Substances will not be mixed with one another unless recommended by the manufacturer.
5. Whenever possible, all of a product will be used up before disposing of the container.
6. Manufacturers' recommendations for proper use and disposal will be followed.
7. The site superintendent will inspect daily to ensure proper use and disposal of materials onsite.

*Hazardous Products Practices*

These practices will be used to reduce the risks associated with hazardous materials, if hazardous materials are used.

1. Products will be kept in original containers unless they are not reseal able.
2. Original labels and material safety data will be retained.

3. If surplus product must be disposed of, manufacturers' or local and state recommended methods for proper disposal will be followed.

*Product Specific Practices*

The product specific practices to be followed are listed in Table 1.

| TABLE 1 |
|---|
| Product Specific Practices |
| The following product specific practices will be followed onsite:<br><br><u>Petroleum Products:</u><br><br>All onsite vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers, which are clearly labeled. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations. |
| <u>Fertilizers:</u><br><br>Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked in the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills. |
| <u>Paints:</u><br><br>All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm water system but will be properly disposed of according to manufacturers' instructions or State and local regulations. |
| <u>Concrete Trucks:</u><br><br>Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water on the site. |

*Spill Prevention Practices*

The spill prevention practices to be followed are listed in Table 2.

| TABLE 2 |
| --- |
| Spill Prevention Practices |
| In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:<br><br>• Manufacturers' recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.<br><br>• Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include but not be limited to brooms, dustpans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.<br><br>• All spills will be cleaned up immediately after discovery.<br><br>• The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.<br><br>• Spills of toxic or hazardous material will be reported to the appropriate State or local government agency, regardless of the size.<br><br>• The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included.<br><br>• The site superintendent responsible for the day-to-day site operations will be the spill prevention and cleanup coordinator. He will designate at least three other site personnel who will receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of responsible spill will be posted in the material storage area and in the office trailer onsite. |

## *4.7 Any Additional BMPs:* N/A

## *4.8 Allowable Non-Stormwater Discharge Management*

1. Water used to wash vehicles where detergents are not used
2. Water used to control dust
3. Potable water sources including line flushing
4. Uncontaminated ground or spring water

# SECTION 5: SELECTING POST-CONSTRUCTION BMPs

N/A

# SECTION 6: INSPECTIONS

## *6.1 Inspections*

***1. Inspection Personnel:*** The Contractor shall provide qualified personnel to inspect disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, structural control measures, and locations where vehicles enter and exit the site.

***2. Inspection Schedule and Procedures:***

The contractor shall inspect the disturbed areas at least once every fourteen (14) calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater, or the contractor may establish a specific day each week for inspections to occur. Erosion and sedimentation control measures identified in the SWP3 shall be observed to ensure that they are operating correctly. Based on the results of the inspection, the SWP3 shall be modified as necessary (e.g. show additional controls on the erosion/sedimentation controls plan sheet and revise description of controls) to include additional or modified controls, or best management practices (BMPs), designed to correct problems identified. Revisions to the SWP3 shall be completed within 7 calendar days following the inspection. If existing controls need to be modified or if additional controls are necessary, implementation shall be completed before the next anticipated storm event, or as soon as practicable.

Contractor shall attach a copy of the inspection report to be used for the site.

## *6.2 Delegation of Authority*

Contractor shall identify the individual(s) who have authority to sign inspection reports, certification and other information.

## *6.3 Corrective Action Log*

Corrective Action Log:
Contractor shall maintain a log of corrective actions.

# SECTION 7: RECORDKEEPING AND TRAINING

## *7.1 Recordkeeping*

Records will be retained for a minimum period of at least 3 years after the permit is terminated.

Contractor shall maintain a log of date(s) when major grading activities occur.

Contractor shall maintain a log of date(s) when construction activities temporarily or permanently cease on a portion of the site.

Contractor shall maintain a log of date(s) when an area is either temporarily or permanently stabilized.

### *7.2 Log of Changes to the SWPPP*

# SWP3 LOG OF CHANGES AND UPDATES

| DATE | CHANGE/UPDATE |
|---|---|
| | |
| | |
| | |
| | |
| | |
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### *7.3 Training*

Individual(s) Responsible for Training:

Name: _____ Title:_____

Name: _____ Title:_____

Describe Training Conducted:
• General stormwater and BMP awareness training for staff and subcontractors:

• Detailed training for staff and subcontractors with specific stormwater responsibilities:

## SECTION 8: PERMANENT STABILIZATION

All disturbed areas will be revegetated as shown on the construction plans. Seed mix is shown in the Project Manual in Standard Specification 604S pages 3 and 4. Topsoil requirements are shown in the Project Manual in Standard Specification 601S page 1.

## SECTION 9: CERTIFICATION AND NOTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____ Title:_____

Signature:_____Date:_____

Repeat as needed for multiple construction operators at the site

# SECTION 01170
# SPECIAL PROVISIONS

## PART 1 GENERAL

### 1.01 INSTALLATION OF EQUIPMENT

A. Special care shall be taken to ensure proper alignment of all equipment with particular reference to the pumps, fans, and electric drives. The units shall be carefully aligned on their foundations by qualified millwrights after their sole plates have been shimmed to true alignment at the anchor bolts. The anchor bolts shall be set in place and the nuts tightened against the shims. After the foundation alignments have been approved by the Engineer, the bedplates or wing feet of the equipment shall be securely bolted in place. The alignment of equipment shall be further checked after securing to the foundations, and after conformation of all alignments, the sole plates shall be finally grouted in place. The Contractor shall be responsible for the exact alignment of equipment with associated piping and under no circumstances, will "pipe springing" be allowed.

B. All wedges, shims, filling pieces, keys, packing, grout, or other materials necessary to properly align, level and secure apparatus in place shall be furnished by the Contractor. All parts intended to be plumb or level must be proven exactly so. Perform all grinding necessary to bring parts to proper bearing after erection.

### 1.02 SLEEVES AND OPENINGS

A. Provide all openings, channels, chases, etc. and install anchor bolts and other items to be embedded in concrete, as required to complete the work under this Contract, together with those required by subcontractors and perform all cutting and patching, excepting cutting and patching of materials of a specified trade and as stated otherwise in the following paragraph.

B. Subcontractors shall furnish all sleeves, inserts, hangers, anchor bolts, etc, required for the execution of their work. It shall be their responsibility before the work of the Contractor is begun to furnish him with the above items and with templates, drawings or written information covering chases, openings, etc, which they require and to follow up the work of the Contractor as it progresses, making sure that their drawings and written instructions are carried out. Failing to do this, they shall be responsible for the cost of any corrective measures which may be required to provide necessary openings, etc. If the Contractor fails to carry out the directions given, covering details and locations of openings, etc., he shall be responsible for any cutting and refinishing required to make the necessary corrections. In no case shall beams, lintels, or other structural members be cut without the approval of the Engineer.

### 1.03 SUBMITTALS

A. Submit to the Engineer in accordance with Section 01300, a valve schedule as specified in Paragraph 1.10.

### 1.04 GREASE, OIL AND FUEL

A. All grease, oil and fuel required for testing of equipment shall be furnished with the respective equipment. The Owner shall be furnished with a year's supply of required lubricants including

grease and oil of the type recommended by the manufacturer with each item of equipment supplied under Divisions 11, 13, and 15.

1.05 TOOLS

A. Any special tools (including grease guns or other lubricating devices) which may be necessary for the adjustment, operation and maintenance of any equipment shall be furnished with the respective equipment.

B. Tools shall be furnished in heavy steel tool boxes complete with lock and duplicate keys.

1.06 ARCHITECTURAL COATINGS

A. Maintain coordination among all Sections windows, window walls, louvers, doors and frames, etc requiring specified coatings. All coatings shall match to the satisfaction of the Engineer with regard to color and texture. Items rejected by the Engineer shall promptly be removed from the job site.

1.07 PIPE MARKING

A. Pipe marking is included in Division 09 under Painting, but it shall be the Contractor's responsibility to assist, as required by the Engineer, in identifying pipe contents, direction of flow and all else required for proper marking of pipe. Subcontractors responsible for piping in shall be required by the Contractor to assist when necessary.

1.08 VALVE IDENTIFICATION

A. The Contractor shall prepare a valve schedule for all valves required for the work showing a number, the location, type, function, and normal operating position, for each valve. The schedule shall be submitted, in accordance with Section 01300, to the Engineer for approval not less than 120 days prior to start-up.

B. The Contractor shall furnish tags for all valves required for the work. Valve tags shall be 2-in diameter, 19 gauge, brass or plastic, with brass hooks suitable for attaching the tag to the valve operator. Tags shall be stamped or etched with the valve number and the information on the valve schedule coded in a system provided by the Owner. Submit two samples of the type of tag proposed and the manufacturer's standard color chart and letter styles to the Engineer for approval.

C. The Contractor shall install valve tags on all valves required for his work and deliver tags to each subcontractor for installation on all valves required for their work.

1.09 NOISE LIMITATIONS

A. Refer to City Specification 01500.

1.10 SPARE PARTS

A. Where spare parts are specified in the technical sections, furnish all spare parts recommended by the manufacturer or system supplier for one year of service. In addition, furnish all spare parts itemized in each Section.

B. Collect and store all spare parts in an area to be designated by the Engineer. Furnish the Engineer with an inventory listing all spare parts, the equipment they are associated with, the name and address of the supplier and the delivered cost of each item. Copies of actual invoices for each item shall be furnished with the inventory to substantiate the delivery cost.

C. Spare parts shall be packed in cartons, properly labeled with indelible markings with complete descriptive information including manufacturer, part number, part name and equipment for which the part is to be used and shall be properly treated for one year of storage.

1.11 WEATHER PROTECTION

A. In the event of inclement weather, the Contractor and subcontractors shall protect the Work and materials from damage or injury from the weather. If, in the opinion of the Engineer, any portion of the Work or materials has been damaged by reason of failure on the part of the Contractor or subcontractors to so protect the Work, such Work and materials shall be removed and replaced with new materials and Work to the satisfaction of the Engineer and at no additional cost to the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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# SECTION 01171
# ELECTRIC MOTORS TO 250 HP

## PART 1 GENERAL

### 1.01 SCOPE OF WORK

A. Random wound, NEMA frame motors up to 250 Hp furnished under other Sections shall comply with the requirements listed in this Section.

B. Motors connected to Variable Frequency Drive Controllers shall be designed for inverter duty.

### 1.02 RELATED WORK

A. Electrical is included in Division 16.

### 1.03 SUBMITTALS

A. Submit motor nameplate data and test characteristics per NEMA Standard MG1-12.54 "Report of Test Form for Routine Tests on Induction Motors" in accordance with Section 01300 – Submittals, including:

1. Efficiency at 1/2, 3/4, and full load.

2. Power factor at 1/2, 3/4, and full load.

3. Motor outline, dimensions and weight.

4. Descriptive bulletins, including full description of insulation system.

5. Bearing design data.

6. Special features (i.e., space heaters, temperature detectors, etc.).

7. Power factor correction capacitor rating and type.

8. For motors that will be operated with solid state reduced voltage starters, submit:
   a. Across-the-line and reduced voltage speed/torque and speed/current acceleration curves using actual driven load Wk2 curves. Curves shall include speed/torque, speed/current and speed/power factor acceleration curves for 100 percent of rated voltage, and for voltage associated with an inrush current of 350 percent motor FLA. Acceleration current curves shall be superimposed on the thermal damage curves.
   b. Number of safe starts in succession for the above listed voltages.
   c. Recommended KVAR to raise the motor power factor to 0.95 lagging and maximum KVAR allowed before overexciting the motor.

### 1.04 REFERENCE STANDARDS

A. American Bearing Manufacturers Association (ABMA)

1. ANSI/ABMA 7 - Shaft and Housing Fits for Metric Radial Ball and Roller Bearings (Except Tapered Roller Bearings) Conforming to Basic Boundary Plans

2. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings

3. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings

B. American National Standards Institute (ANSI)

1. ANSI/NCSL Z540-1 – Calibration Laboratories and Measuring and Test Equipment, General Requirements

C. American Society for Testing Materials (ASTM)

1. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus

D. Institute of Electrical and Electronics Engineers (IEEE)

1. IEEE 1 - Recommended Practice - General Principles for Temperature Limits in the Rating of Electric Equipment and for the Evaluation of Electrical Insulation

2. IEEE 43 - Recommended Practice for Testing Insulation Resistance of Rotating Machinery

3. IEEE 85 - Test Procedures for Airborne Sound Measurements on Rotating Electric Machinery

4. IEEE 112 - Standard Test Procedure for Polyphase Induction Motors and Generators

5. IEEE 792 - Recommended Practice for the Evaluation of the Impulse Voltage Capability of Insulation Systems for AC Electric Machinery Employing Form-Wound Stator Coils

6. IEEE 841 - Standard for Petroleum and Chemical Industry - Severe Duty Squirrel Cage Induction Motors - Up to and Including 500 HP

E. International Organization for Standardization (ISO)

1. ISO 10012-1 - Quality Assurance Requirements for Measuring Equipment

2. ISO 1940-1- Mechanical Vibration, Balance Quality Requirements of Rigid Rotors

3. ISO 1940-2 - Determination of Permissible Residual Unbalance

4. ISO 10816-1- Mechanical Vibration, Evaluation of Machine Vibration by Measurements on Non-Rotating Parts - Part 1: General Requirements

5. ISO 9001- Quality Management Systems - Requirements

F. National Electrical Manufacturers Association (NEMA)

1. NEMA MG1 - Motors and Generators

2. NEMA MG2 - Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators

3. NEMA MG3 - Sound Level Prediction for Installed Rotating Electrical Machines

4. NEMA MG10 - Energy Management Guide for selection and use of Polyphase Motors

G. National Fire Protection Association (NFPA)

1. NFPA 70 - National Electric Code

H. Underwriters Laboratories (UL)

1. UL 674 - Motors and Generators, Electric, for Use in Hazardous Locations, Class I - Groups C and D, Class II - Groups E, F and G

I. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. Motors shall be listed under UL recognized component file as applicable.

B. The motor manufacturer shall maintain a documented ISO 9001 quality assurance program implementing suitable procedures and controls to monitor all aspects of production and testing.

C. Motor manufacturer shall maintain authorized service centers capable of providing training, parts, and emergency maintenance and repairs.

D. Electric motors driving identical machines shall be identical.

1.06 SYSTEM DESCRIPTION

A. To assure unity of responsibility, the motors shall be furnished and coordinated by the manufacturer of the driven equipment. The Contractor shall assume responsibility for the satisfactory installation and operation of the entire system as specified.

B. When electrically driven equipment differs from that indicated, adjust the motor size, wiring and conduit systems, disconnect devices, and circuit protection to accommodate the equipment actually installed, without additional cost.

1.07 MATERIALS AND EQUIPMENT

A. Motors shall be shipped fully assembled with the driven equipment. Provide storage and handling per motor manufacturer’s installation instructions and Section 01600 – Materials and Equipment.

B. When furnished, energize motor space heaters to prevent moisture condensation throughout the storage and construction period. Perform periodic motor insulation resistance tests per manufacturer's storage recommendation.

C. Maintain the bearings during storage and construction, and periodically rotate the motor shaft according to manufacturer's instructions.

1.08 PROJECT/SITE REQUIREMENTS

A. Power supply: 208, 240, or 480 VAC, three phase, 60 Hertz as indicated for 1/2 Hp and above; 120, 208, or 240 VAC single phase, 60 Hertz for less than 1/2 Hp.

B. Environmental Requirements: unless otherwise stated, suitable for continuous duty operation without derating under the following service conditions:

1. Environment: Wastewater treatment plant indoor or outdoor applications involving severe duty conditions such as high humidity or chemical laden, corrosive or salty atmospheres.

2. Area classification: as indicated on the Drawings.

3. Minimum outdoor ambient temperature: 0 degrees C.

4. Maximum ambient temperature: 40 degrees C.

5. Altitude: up to 500 feet above MSL.

C. Coordination:

1. Coordinate motor installation and equipment layout with conduit and wiring, piping, other machinery equipment, and adjacent surfaces. Maintain required access clearances for cooling air, conduit box, lubrication and coupling.

2. Coordinate size and location of concrete pads for motors and equipment soleplates.

3. Coordinate voltage and current ratings of motors and accessories such as space heaters with power supply characteristics, and overcurrent and overload protective devices per the NEC.

4. Coordinate winding and bearing protective devices with ratings and characteristics of monitoring equipment circuits to which they connect. Coordinate control sequences and temperature setpoints.

1.09 WARRANTY

A. Warranties: in accordance with Section 01740 - Warranties and Bonds but extended as follows:

1. Inverter duty motors: warranted for 36 months on inverter power.

2. Severe duty motors: warranted for 60 months on sine wave power.

1.10 DEFINITIONS

A. Definition of terms used in this specification shall be in accordance with NEC Article 100, ANSI/IEEE Standard 100, and UL Standards Glossary.

B. Definitions of Enclosure Types for Motors

1. ODP - Open Drip-Proof

2. TEFC - Totally Enclosed, Fan-Cooled

3. TEAO - Totally Enclosed, Air Over

4. TEXP - Totally Enclosed, Explosion-Proof

5. IP-22 - Open Drip-Proof

6. IP-44 - Totally Enclosed

7. IP-54 - Splash Proof

8. IP-55 - Washdown

PART 2 PRODUCTS

2.01 GENERAL

A. Torque output: minimum performance characteristics for locked rotor and breakdown torque with rated voltage and frequency applied as defined by NEMA MG1, to accelerate and operate the load throughout its operating speed range, including conditions imposed by reduced voltage starting methods.

B. Motors shall deliver the specified performance at rated load under the combinations of voltage and frequency variations and voltage unbalance specified in NEMA MG1.

C. Horsepower rating: sized for operation within the full load nameplate rating without applying the service factor, throughout the full range of mechanical or hydraulic operating condition.

D. Service Factor: 1.15 service factor on sine wave power and 1.0 service factor on VFD power in a 40-degree-C ambient.

E. Specific motor application data such as Hp, rpm, enclosure type, etc., is specified under the detailed driven mechanical equipment specification.

F. Enclosures: conform to one of the following NEMA standard enclosure designs as specified under the detailed driven mechanical equipment specification. If no enclosure type is specified, provide TEFC enclosures:

1. Open Drip Proof (ODP)

2. Totally Enclosed Fan Cooled (TEFC)

3. Totally Enclosed Explosion Proof (TEXP)

G. Nameplates: engraved or embossed on stainless steel fastened to the motor frame with stainless steel screws or drive pins with information per NEMA MG1.

2.02 SINGLE-PHASE MOTORS

A. Application: motors smaller than 1/2 Hp shall be 115/230 or 208 Volts single phase, continuous heavy duty, reversible, capacitor start. Small fan motors may be split-phase or shaded pole type if such are standard for the equipment. Wound rotor or commutator type single-phase motors are not acceptable unless their specific characteristics are necessary for the application.

B. Overload protection: provide internal automatic thermal overloads unless otherwise noted.

C. Insulation: Class F or better, with Class B temperature rise, 1.15 service factor. Locked rotor current shall not be greater than specified in NEMA Standard MG1, Design "N".

D. Enclosure: provide fully gasketed, totally-enclosed air over or fan cooled in conformance with NEMA Standard MG1. Small fan motors may be open type if suitably protected from moisture, dripping water and lint accumulation.

E. Washdown duty: Where motor is installed in wet or corrosive areas routinely exposed to washdowns, high humidity or caustic chemicals, provide stainless steel, paint free washdown motors with Inpro bearing isolators, stainless steel T-type condensation drains, nitrile conduit box gasket, and corrosion resistant fans.

F. Bearings: sealed ball bearings permanently lubricated for 10 years' normal use, furnished with shaft slinger.

G. Class 1, Division 1 and 2 locations: Single phase motors installed in Class 1, Division 1 and 2 locations shall be explosion proof, marked with a T3B temperature code label, and UL listed for use in Class 1, Division 1, Groups C & D, and Class II, Groups E, F, & G hazardous location. The temperature code marking shall appear on the nameplate.

2.03 THREE-PHASE INDUCTION MOTORS

A. Applications

1. Energy efficiency: meet or exceed requirements of NEMA MG1 Part 12 for NEMA Premium Efficient motors, for 1 Hp and larger. Where State Energy Codes or Utility Company Energy Rebate Programs dictate higher efficiencies than those listed, comply with the more stringent standard.

2. Severe duty: Motors installed in process areas and wet or corrosive locations shall be of a type designated by the manufacturer as "Corro Duty", "Mill and Chemical", "Severe Duty", or similar quality designation.

3. Class 1, Division 2 locations: Motors in Class 1, Division 2 locations shall be marked with a temperature code label suitable for use in the hazardous area classification where installed. Motors shall also comply with IEEE 841 severe duty requirements, with the following additional requirements:
   a. The Class, Group and Temperature Code shall be one of the following:
   b. Class I Group D - T2B (260°C).
   c. Class I Group D, Class II Groups F and G - T3B (165°C).
   d. Class I Groups C and D, Class II Groups F and G - T3C (160°C).
   e. Thermostats: Where winding thermostats are used to obtain surface temperature limitation, the thermostats shall be connected in series with the starter holding coil (stop button). Winding temperature detectors and switches shall be UL listed for use in Class 1, Division 1 locations.
   f. The exposed surface of motor condensation heaters shall not exceed 80 percent of the nameplate temperature code value.
   g. Ventilation fan shall be constructed of corrosion-resistant, non-sparking material such as bronze.

4. Class 1, Division 1 locations: Motors installed in Class 1, Division 1 locations shall be explosion proof, temperature code T3C (160°C), listed for use in Class 1, Division 1, Group C & D locations in accordance with UL 674. The operating temperature or temperature range marking shall appear on the nameplate, indicating the maximum temperature for all conditions including overload, locked rotor and single phasing.

5. Inverter Duty: Motors connected to Variable Frequency Drive Controllers shall be designed for inverter duty and shall comply with the following:
   a. Definite purpose: Motors operated on variable frequency drives shall be designed specifically for inverter duty, per NEMA MG1, Part 31, and comply with IEEE 841. Motors shall be designed for constant or variable torque over the speed range required by the driven equipment application. Motors shall be capable of across the line starting at the motor minimum terminal voltage with an acceptable maximum locked rotor current.
   b. Torsional critical speed: first or second torsional shall not be encountered within the operating speed range. Rotors shall be stiff shaft design, statically and dynamically balanced with the first lateral critical speed at least 15% above the maximum running speed.
   c. Thermal protection: provide three internal bi-metallic, temperature actuated switches, unless other type of thermal protective device is specified in the mechanical equipment section.
   d. Cooling provisions: maintain temperature rises at design levels while operating throughout the speed range. Ventilation system shall be designed for maximum heat transfer including larger fans or auxiliary cooling fans to maintain proper low speed cooling.
   e. Inverter grade insulation system: minimum Class F or better insulation materials with additional phase insulating material, extra end-turn bracing and Class H spike resistant wire. The resultant system shall withstand up to 2000 Volt transients without premature motor failure and have no cable limitations in motor application.
   f. Motor shaft currents: insulate the ODE bearing and provide a shaft grounding strap. Insulate bearing probes to prevent shorting out bearing insulation.

B. Construction

1. Stator core: built up, fully processed, high grade, low loss silicon steel laminations keyed or dovetailed to the stator frame and securely held in place at each end.

2. Stator winding: assembled using random wound copper coils. A split component epoxy insulation system shall be used in order to provide high resistance to moisture and other contaminates.

3. Insulation: manufacturer's premium grade non-hygroscopic, chemical and humidity resistant insulation system consisting of Class F or H materials, operated at Class B temperature rise, with at least one impregnation cycle using solventless resin, and multiple additional dip and bake cycles using polyester varnish.

4. Motor leads: non-wicking type, minimum Class F temperature rating and permanently numbered for identification.

5. Rotor shaft: forged or rolled steel, accurately machined, smoothly finished, with sufficient strength to withstand all stresses resulting from normal operation at any speed up to and including a 25 percent overspeed condition. Coordinate shaft end details with driven equipment coupling.

6. Rotor core: solid, built-up stack of fully processed and coated, high-grade, low-loss silicon steel laminations, with die cast aluminum or fabricated copper bars or their respective alloys. Rotors on frames 213T and above shall be keyed to shaft and rotating assembly dynamically balanced.

7. Cooling fan: corrosion-resistant, bi-directional, keyed, clamped and shouldered on the shaft.

8. Rotor assembly: coated with a corrosion resistant epoxy insulating varnish or other protective coating, thermally stable, statically and dynamically balanced. Balance weights shall be securely attached to the rotor resistance ring by welding or similar permanent method.

C. Bearings

1. Horizontal Bearings
   a. Bearings: anti-friction open or single-shield, vacuum-degassed steel ball or roller bearings, electric motor quality. Metric size bearings are not acceptable.
   b. Maximum bearing temperature rise: 50 degrees C for two pole motors, 45 degrees C for all other motors, measured at rated load by RTD or thermocouple at bearing outer race.
   c. Lubrication: factory lubricated with a premium moisture resistant polyurea thickened grease containing rust inhibitors and suitable for operation over temperatures from -30 to 150 degrees C. with standard lube and relief fittings for re-greasing external lubrication while machine is in operation. Motors shall be NEMA Size 140 frame motors and smaller than may be permanently lubricated.
   d. Minimum Rated fatigue life: L10 life of 100,000 hours per ABMA 9 or ABMA 11 for direct coupled applications and 26,000 hours for belted applications based on NEMA belting application limits per NEMA MG1. Severe duty motors shall have increased bearing life of 150,000 hours for direct coupled applications and 50,000 hours for NEMA belted applications per IEEE 841.
   e. Shaft seals: prevent grease leakage and the entrance of foreign materials, such as water and dirt, into the bearing area while running, coasting, or at rest. Severe duty motors shall have improved sealing per IEEE 841.

2. Vertical Bearings
   a. Bearings: manufacturer's standard design, constructed with thrust bearings on top to allow inspection and/or replacement without requiring complete disassembly of motor, of type and size to satisfy thrust loading requirements, rated for an in-service B-10 life of 8800 hours per ABMA, designed to support the weight of the rotor plus, if required, the weight of the rotating driven equipment parts and the hydraulic thrust created by the driven equipment, with a 40 degrees C maximum temperature rise. Metric bearings are not acceptable.
   b. Coordinate all thrust conditions, including shutoff, and shaft requirements with the manufacturer of the driven equipment.
   c. Normal thrust applications: use grease lubricated deep-groove ball type thrust bearings only on normal thrust design motors, capable of handling thrust loads in either direction.
   d. High thrust applications: use single or multiple angular contact ball bearings. Anti-friction thrust bearings shall be designed for an L10 life of 100,000 hours including rotor weight. For applications with higher thrust loads which cannot meet the L10 life, spring loaded spherical roller thrust bearings may be used.
   e. Guide bearings: deep-groove ball type located at the bottom of the motor, capable of withstanding all stresses incident to the normal operation of the unit and to the specified overspeed condition, with sufficient means for preventing the leakage of lubricant or entrance of foreign matter along the shaft. When furnished as guide bearings for high thrust units, they shall be oil lubricated. Hollow shaft motors shall have a steady bushing to support the head shaft at the lower end of the motor.
   f. Grease lubricated bearings: furnished with provisions for in-service positive lubrication and a drain to guard against over lubrication.
   g. Oil lubricated bearings: contained in an oil reservoir with sight level gauge, fill and drain openings with plugs, designed to prevent leakage and excessive aeration of the oil.

h. Anti-backspin device: when specified or requested by the pump manufacturer, provide a shaft mounted, mechanical non-reverse ratchet rated at 100 percent of motor full load torque for immediate protection against reversing due to phase reversals or from backspin at shutdown.

D. Enclosures

1. Motor frames: cast iron or welded heavy plate steel construction, stiff enough to withstand the rotating forces and torques generated and shall be designed to limit or avoid any undesirable harmonic resonances. Provide a threaded, forged steel, shouldered eyebolt blind tapped into the motor frame for lifting.

2. Condensate drain openings: locate drain holes at the low points in the end brackets to allow removal of accumulated moisture from enclosures. Provide corrosion resistant, breather drain plugs for severe duty motors.

3. Enclosure type: as specified in the mechanical equipment section, designed in accordance with NEMA MG1. Totally enclosed designs shall be suitable for outdoor use.

4. Hardware: hex head, SAE Grade 5 or better, plated for corrosion protection.

5. Main terminal box: fabricated steel or cast iron, sized per the NEC for number and size of conduit connections as indicated on the Drawings, arranged to accommodate conduit entry from any quadrant, with a grounding terminal and gaskets between the box and motor frame and between the box and its cover.

6. Bearing housings: provide machined surfaces for attaching a magnet mounted accelerometer in order to monitor the motor vibration in the vertical, horizontal, and axial directions at each bearing housing.

7. Space heaters: provide silicone rubber strip type enclosure heaters for outdoor motors, or where otherwise specified. Heaters shall be rated 120 Volt, single phase, designed to prevent condensation inside the enclosure when the motor is idle, with leads brought out to the motor terminal box. The heater wattage and voltage shall be embossed on the motor nameplate.

8. Frame grounding: provide motor frame grounding pad or threaded stud where supplemental grounding to frame is indicated on the Drawings.

E. Accessories: provide where specified under the detailed mechanical specifications for individual equipment:

1. Winding temperature switch: three, snap action, bi-metallic, temperature actuated switches embedded in the connection end-turns of the motor winding with normally closed contacts and leads terminating in the main conduit box.

2. Winding temperature relay: complete winding thermal protection system consisting of three PTC thermistors and a separately mounted, separately excited, 115 VAC, 1 phase, solid state control module with dual Form C contacts, mounted in a NEMA 4X enclosure.

3. Stator temperature detectors: Six resistance-type temperature detectors (RTDs) embedded in the stator windings, two per phase, symmetrically installed between stator coils where highest

temperature will occur, with leads brought out to a separate accessory terminal box on the motor frame. One set per phase for TEXP motors.

4. Bearing temperature detectors: replaceable, three wire RTDs, one per bearing with spring loaded tip, mounted as closely as possible to the outer surface of each bearing with conduit connection head and terminal block.

5. Bearing temperature relays: indicating type bearing temperature relays, furnished with iron or copper constantan thermocouples, one per bearing.

6. Vibration monitoring switch: acceleration sensitive, NEMA 4 switch, with DPDT contacts rated 5A at 240 VAC/30 VDC, with starting and monitoring time delay circuits equal to Robertshaw Model 376A Vibraswitch. For TEXP motors use Metrix Model 5550, or equal, mounted per manufacturer's instructions.

7. Bearing vibration sensors: provision for mounting sensors per vibration monitoring system manufacturer's instructions. Coordinate with the supplier of the machine monitoring equipment.

F. Power factor correction capacitors: provide where specified under the detailed mechanical specifications for individual equipment:

1. Application: single speed motors over 5 horsepower (except motors powered from variable frequency drives) shall be provided with a heavy duty industrial type power factor correction capacitor selected, recommended and furnished by the motor manufacturer to raise the motor power factor to approximately 95 percent. For non-explosion-proof motors, the capacitor shall be mounted on the equipment base plate adjacent to the motor and shall be connected to the motor junction box with liquid tight flexible conduit. For explosion-proof motors, the capacitors shall be wall mounted in a non-hazardous area.

2. Capacitors: UL listed, NEMA rated and tested, three phase dry film or non-PCB dielectric liquid insulated, with three current limiting fuses rated for 100 kA interrupting capacity at 480 Volts, equipped with internal discharge resistors and fuse loss indicators, mounted in hermetically sealed steel enclosures suitable for conduit connection. Covers shall be gasketed, bolt-on type.

3. Non-linear supply: where connected to distribution systems powering non-linear (VFD) loads, capacitors shall be equipped with low flux density series inductors tuned just below the 5th harmonic frequency. Inductors shall have distributed gaps, brazed connections; varnish impregnated copper windings with 220 degrees C insulation limited to an 80 degrees C temperature rise.

## 2.04 SURFACE PREPARATION AND SHOP COATINGS

A. Cast and Fabricated Components

1. Motor cast iron and fabricated metal components shall be cleaned; free of grease, oil, dirt, or other contaminants; then oxide primed and painted with manufacturer’s standard finish coating.

2. Severe duty motors: surpass the 250-hour salt spray test per ASTM B117.

B. Internal Surfaces

1. Internal surfaces: shaft, rotor, end bells and parts shall be covered with a corrosion-resistant coating of epoxy paint or equal material of 2 mils minimum dry film thickness for increased life against adverse environmental conditions. The stator bore and end turns shall be coated with clear epoxy varnish in addition to the insulating varnish treatment.

2. Shaft extension: protected with a rust preventive strippable coating capable of being peeled off or unwrapped.

3. Machined joints and threaded parts: coated with rust-inhibiting compound.

2.05 FACTORY TESTING

A. Each motor shall be given an unwitnessed routine short commercial test per NEMA MG1 and IEEE 112.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install the motors per manufacturer's installation instructions.

1. Prepare rigid foundation or mounting surface to minimize vibration and maintain alignment between motor and load shaft.

2. Align the motor shaft with driven equipment according to manufacturer’s written instructions. Adjust axial position of motor frame with respect to load shaft.

3. Accurately adjust flexible couplings for direct drive according to machine manufacturer’s guidelines. Check alignment to minimize vibrations. Coupling spacing shall be according to coupling manufacturer guidelines.

4. Anchor motor base to load bearing surface with Grade 5 steel bolts or better.

B. Electrical Connections

1. Install motor branch circuit conduits and conductors in accordance with NEC and local code requirements.

2. Terminate the motor leads per the manufacturer’s connection diagrams.

3. Install equipment grounding conductors per NEC and local code requirements.

4. Tighten electrical connections and terminals according to manufacturer’s published torque values.

5. Install conduit and wiring between motor auxiliary devices and associated indicators, controllers and protective devices in accordance with shop drawings.

6. Connect electro-magnetic field sensitive devices such as RTDs, thermistors, thermal protector switches, and vibration sensors with twisted and shielded instrumentation wiring.

7. When furnished, mount power factor correction capacitor adjacent to the motor and connect to the motor junction box with liquid tight flexible conduit and code sized wiring. For explosion-proof motors, mount the capacitor in a non-hazardous area above or near the MCC.

C. Pre-Commissioning Inspection

1. Inspect for physical damage. Verify all shipping materials and braces are removed.

2. Compare equipment nameplate information with site conditions and report any discrepancies.

3. Inspect for proper mounting, grounding, and wiring connections. Check all hardware for looseness and re-tighten as necessary.

4. Verify that the motor and the coupled load are properly aligned. Inspect bearings for proper lubrication and rotate motor shaft by hand to check for binding. Oil lubricated bearing housings that have been filled with preservative oil shall be drained and re-filled with the proper grade of bearing oil before putting the machine into service.

5. Clean motor externally, on completion of installation. Vacuum dirt and debris; do not use blown compressed air to assist in cleaning.

D. Field Commissioning

1. Perform insulation resistance tests in accordance with manufacturer's instructions. If the test fails, consult the manufacturer and dry out the machine.

2. Perform a phase rotation test to ensure proper shaft direction with load uncoupled.

3. Check all connections with wiring diagrams prior to energizing.

4. Inspect for unusual mechanical or electrical noise or signs of overheating during initial test run.

5. Measure running current and evaluate relative to load conditions and nameplate full load amperes.

END OF SECTION

## 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 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 or OWNER may request to attend.
4. ENGINEER's representative.
5. OWNER's Project Manager.
6. OWNER's REPRESENTATIVE
7. OWNER's Sponsor Department Representative.
8. Representative from the City of Austin, Watershed Protection and Development Review Department, Environmental Inspection Division, if site erosion / sedimentation controls are required.

9. Representative from the City of Austin, Transportation Department if utility coordination has occurred through the Austin Utility Location and Coordination Committee.
10. Representative from the City of Austin, Contract Management Department, Contract Administration Division, to discuss wage.
11. 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'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 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 or OWNER requests to attend.
4. OWNER's REPRESENTATIVE
5. ENGINEER'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.
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, 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**

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## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS:

A. The Contractor prepares submittals. Drawings and general provisions of Contract should be used as the related documents for this requirement, including:

1. Section 00700 - General Conditions
2. Section 00810 - Supplemental General Conditions
3. Division 1 requirements
4. Section 01700 – Contract Closeout
5. Section 01730 – Operation and Maintenance Data
6. Section 01740 – Warranties and Bonds
7. City of Austin Technical Specifications and Special Provisions
8. Special Specifications

### 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
7. Schedule of Valves

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.

**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.

4. The CONTRACTOR is to review shop drawings, product data and samples prior to submission to determine and verify the following.

   a. Field measurements

   b. Field construction criteria

   c. Conformance with the Specifications

5. Each shop drawing, working drawing sample and catalog data submitted by the CONTRACTOR to have affixed to it the following Certification Statement, signed by the CONTRACTOR:

   "By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements."

   All Submittals without the Certification Statement will not be reviewed and will be returned to the CONTRACTOR for proper submission.

6. No portion of the Work requiring a shop drawing, sample or catalog data is to be started nor any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to the approved shop drawings and data to be at CONTRACTOR's risk. The OWNER shall not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

7. Notify the E/A in writing, at the time of submittal, of any deviations in the submittal(s) from the requirements as specified with in the Contract Documents. If deviations are not noted, CONTRACTOR assumes responsibility for corrective action.

8. The review and approval of submittals by the E/A does not relieve the CONTRACTOR from his responsibility with regard to the fulfillment of the terms of the Contract. All risks of error and omission in submittals prepared by CONTRACTOR are assumed by the CONTRACTOR and the E/A shall have no responsibility therefore.

9. All submittals including schedules, shop drawings, logs, sequence plans, product data, samples, QA/QC, technical, record drawings, diaries etc. shall be uploaded to the project File Transfer Protocol (FTP) site in specified folders site by the CONTRACTOR as part of the submittal process.

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. Four (4) hard copies and one electronic of the proposed Construction Schedule and subsequent revisions are required in Microsoft Project and PDF format specified by OWNER. CONTRACTOR must upload to the Owner provided FTP site in specified folders.

2. Four (4) hard copies and one electronic of the proposed Submittal schedule and subsequent revisions are required in searchable format specified by OWNER. CONTRACTOR must upload to the Owner provided FTP site in specified folders.

3. Nine (9) hard copies and one electronic of Shop Drawings, Product, Product Samples, Quality Assurance and Quality Control submittals are are required in searchable format specified by OWNER. CONTRACTOR must upload to the Owner provided FTP site in specified folders.

4. One (1) one electronic of Shop Drawings, Product, Product Samples, Quality Assurance and Quality Control submittals are required in searchable format specified by OWNER. CONTRACTOR must upload to the Owner provided FTP site in specified folders.

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) and upload to the project FTP site. 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.

## 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.
8. Separate 3-week look ahead will not be permitted in-lieu of a fully revised project schedule.
9. Schedule must include the following columns of information: Percent complete (time, cost, labor, etc.), Baseline Start, Baseline End, Baseline Duration, Actual Start, Actual Finish, and Actual Duration.
10. The schedule shall be sequential and have the critical path highlighted with dependencies shown.

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.

## 3.3 SUBMITTAL SCHEDULE

A. Concurrently with the development of the CONTRACTOR's Construction Schedule, prepare a complete schedule of submittals in Excel format. Submit the initial Submittal Schedule in Excel spreadsheet format 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 order by specification division. Provide the following information not limited to:

a. Submittal number.
b. CONTRACTOR reference number.
c. Related Section number or Specification number.
d. Submittal category (Shop Drawings, Product Data, Calculations, Test Results, or Samples).
e. Description of the work covered.
f. Name of the subcontractor.
g. Target due date.
h. Target date for completion of the E/A's review.
i. List the following information to be filled in later:
- Actual Submittal Date.
- Date Rec'd by ENGINEER.
- Scheduled return date for completion of the E/A's review.
- Number of days under review.
- Reviewer.
- Date sent to reviewer.
- Date received from reviewer.
- Verified against SPL (yes/no/NA)?
- Accepted (A) or Rejected (R).
- Action / Note.
- Date returned to CONTRACTOR.
- Days past original target submittal date
- Comments

B. Distribution: Following Owner's response to the initial submittal, print, upload the Excel spreadsheet to FTP site 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 or resubmittals are made, add the new resubmittal to the submittal schedule as a separate item using the nomenclature described in section 3.1 of this specification. 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."

C. 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 TECHNICAL SUBMITTALS REQUIRED

A. Technical submittals required include, but are not limited to, the following list. This list is provided as an aid to the Contractor, but is not intended to be all inclusive. The Contractor shall refer to the Technical Specifications for additional requirements.

| Specification | Type of Submittal |
|---|---|
| 00819 – Security Requirements | Forms, Security Identification |
| 01045 – Cutting and Patching | Written Requests |
| 01170 – Special Provisions | Valve Schedule |
| 01171 – Electric Motors to 250 Hp | Product Data, Test Results |
| 01353 – Construction Equipment Emissions Reduction Plan | Emission Reduction Plan, Closeout Documentation |
| 01480 – Tightness Testing of Liquid Retaining Structures | Testing Plan, Testing Report |

| | |
|---|---|
| 01505 – Construction and Demolition Waste Management Plan | Waste Management Plan, Closeout Documentation |
| 01510 – Construction Indoor Air Quality Management Plan | Indoor Air Quality Management Plan |
| 01900 – Prohibition of Asbestos Containing Materials | Affidavits |
| 102S – Clearing and Grubbing | Removal and Deposition of Materials Plan |
| 104S – Removing Portland Cement Concrete | Removal and Deposition of Materials Plan |
| 111S - Excavation | Removal and Deposition of Materials Plan |
| 130S – Borrow | Material Data, Managing Borrow Sites Plan |
| 201S – Subgrade Preparation | Subgrade Identification Plan, Equipment Data, Test Results |
| 204S – Portland Cement Treatment for Materials in Place | Mix Designs, Construction Equipment Plan and Data |
| 210S - Flexible Base | Material Data, Test Results |
| 236S – Proof Rolling | Roller Equipment Plan and Data |
| 360S - Concrete Pavement | Material Data, Mix Designs, Test Results |
| 401S – Structural Excavation and Backfill | Excavation Safety System Plan, Test Results |
| 402S – Controlled Low Strength Material | Material Data, Mix Designs, Test Results |
| 403S - Concrete for Structures | Material Data, Mix Designs, Test Results |
| 410S – Concrete Structures | Mix Designs, Product Data, Test Results, Submitted Manufacturers |
| 509S - Excavation Safety Systems | Excavation Safety Systems Plan, Calculations |
| 510 - Pipe | Material Data, Product Data |
| 511S – Water Valves | Material Data, Product Data |
| 601S – Salvaging and Placing Topsoil | Test Results, Soil Classification |
| 602S – Sodding for Erosion Control | Material Data, Product Data |
| 604S – Seeding for Erosion Control | Material Data, Product Data, Seeding Methods |
| 606S – Fertilizer | Material Data, Product Data, Soil Type |
| 608S - Planting | Material Data, Product Data, Planting Methods |
| 609S – Native Grassland Seeding and Planting for Erosion Control | Material Data, Product Data, Planting and Seeding Methods |
| 610S - Preservation of Trees and Other Vegetation | Product Data, Preservation Plan |
| 639S - Rock Berm | Material Data, Product Data |
| 641S – Stabilized Construction Entrance | Material Data, Drainage Plan |
| 642S – Silt Fence | Product Data, Test Reports, Revegetation Plan |
| 648S – Mulch Sock | Material Sample, Testing Plan, Test Results |
| 720S – Metal for Structures | Test Reports, Material Data, Product Data |
| 721S – Steel Structures | Product Data, Shop Drawings, Welding Procedures, Design Data, Certifications |
| 723S – Structural Welding | Test Reports, Welding Procedures |
| SP 410S – Concrete Structures | Construction Plans |
| 02140 – Dewatering and Drainage | Engineer Certification, Dewatering and Drainage Plan |
| 02270 – Erosion and Sedimentation Control | Product Data |
| 02623 – Buried Polyvinyl Chloride (PVC) Pressure Pipe | Product Data, Test Results, Certification, Shop Drawings |

| | |
|---|---|
| 02624 – Cleaning and Slip-lining of Existing Pipe | Pipe Cleaning Plan, Shop Drawings, Product Data, Pipe Jointing Method |
| 05015 – Stainless Steel Fabrications | Product Data, Shop Drawings, Material Data, Certifications |
| 05120 – Structural Steel | |
| 05500 – Metal Fabrications | Product Data, Shop Drawings, Test Results, Design Calculations, Certification |
| 05511 – Metal Stairs | Product Data, Shop Drawings, Design Calculations, Certification |
| 05520 – Aluminum Handrails | Product Data, Shop Drawings, Design Calculations, Certification |
| 08220 – Fiberglass Reinforced Plastic Doors and Frames | Product Data, Shop Drawings, Door Samples, Certifications |
| 09850 – Corrosion Protection for Concrete Structures | Product Data, Material Data, Certifications |
| 09901 – Surface Preparation and Shop Prime Painting | Product Data, Shop Drawings |
| 09902 – Painting | Product Data, Shop Drawings, Color Cards, Schedule |
| 11258 – Odor Control Bioscrubber System | Product Data, Shop Drawings, Certifications, Design Calculations, Wiring Diagrams, Material Data, Test Procedures and Results, Operating Curves |
| 11318 – Submersible Chopper Pumps | Product Data, Shop Drawings, Certification, Wiring Diagrams, Test Procedures and Results, Operating Curves |
| 11364 – Gravity Thickener Equipment | Product Data, Shop Drawings, Design Calculations, Wiring Diagrams, Material Data, Test Reports, Certifications |
| 13390 – Packaged Control Systems | Product Data, Shop Drawings, Wiring Diagrams, Programming Documentation, Sequence of Operation, Test Procedures and Results |
| 14130 – Trailer Mounted Valve Operator | Product Data, Shop Drawings, Handling Procedures |
| 15050 – Process Mechanical Piping – General Requirements | Product Data, Shop Drawings, Test Reports, Certifications |
| 15053 – Common Work Results for HVAC | Certifications |
| 15061 – Steel Pipe and Fittings | Material Data, Product Data, Shop Drawings, Schedule, Certification |
| 15064 – Plastic Pipe and Fittings | Product Data, Shop Drawings |
| 15072 – Ductile Iron Pipe and Fittings | Product Data, Shop Drawings, Certification |
| 15083 – HVAC Insulation | Product Data, Quality Control Reports |
| 15100 – Plant Process Mechanical Valves and Appurtenances | Product Data, Shop Drawings, Certification |
| 15120 – Process Mechanical Piping Specialties | Product Data, Shop Drawings, Certification, Field Reports |
| 15140 – Process Mechanical Pipe Hangers and Supports | Product Data, Shop Drawings, Support System Design Report, Certification |
| 15250 – Thermal Insulation | Product Data, Certification |
| 15530 – Package Air Conditioning Unit | Product Data, Shop Drawings, Wiring Diagrams |
| 15815 – Metal Ducts | Product Data, Shop Drawings |

| | |
|---|---|
| 15855 – Diffusers, Registers, and Grilles | Product Data, Samples |
| 15891 – Fiberglass Reinforced Plastic Ductwork and Accessories | Product Data, Shop Drawings, Handling Requirements, Samples, Design Calculations, Test Result |
| 15950 – Testing, Adjusting, and Balancing | Test Procedures and Results |
| 16150 – Raceways, Fittings, and Supports | Product Data, Material Data, Certification |
| 16200 – Wiring (600 Volts and Below) | Product Data, Shop Drawings |
| 16250 – Boxes and Cabinets | Product Data, Shop Drawings |
| 16300 – Wiring Devices | Product Data, Shop Drawings, Certification |
| 16350 – Lighting | Product Data, Shop Drawings |
| 16450 – 600 Volts and Below Dry Type Transformers | Product Data, Shop Drawings , Wiring Diagram |
| 16500 – Panelboards | Product Data, Shop Drawings, Protection Curves |
| 16540 – Field Control Stations | Product Data, Shop Drawings |
| 16550 – Grounding | Product Data, Shop Drawings |
| 16600 – Disconnect Switches and Enclosures | Product Data, Shop Drawings |
| 16800 – Calibration, Testing and Settings | Test Procedures and Results, Certifications |
| 17100 – Process Instrumentation and Control System PICS | Product Data, Shop Drawings, Schedule, Training Plan, Certification |
| 17200 – Instrumentation and Control Cabinets and Associated Equipment | Product Data, Shop Drawings, Color Chart |
| 17380 – Field Instrumentation and Sensing Devices | Product Data, Shop Drawings, Wiring Diagrams, Test Results, Training Plan |
| 17381 – Magnetic Flow Meters | Product Data, Shop Drawings, Wiring Diagrams, Test Results, Training Plan, Calibration Data |
| 17600 – Distributed Control System | Product Data, Shop Drawings, Wiring Diagrams |

## 3.10 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.

## 3.11 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.
3. CONTRACTOR will submit to the OWNER and upload an electronic copy to the FTP site of the redline drawings before final submittal to the E/A.

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.

## 3.12 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.
18. Date of notice to proceed, duration, date of substantial completion, percent of time used.
19. At a minimum, 6 digital photos with date stamped inside camera taken before start of work and after completion at appropriate times showing representative work, incorporated into the PDF diary (not provided separately).

### 3.13 REQUEST FOR INFORMATION (RFI) LOG

A. The CONTRACTOR will be responsible for providing and updating an Request For Information (RFI) log throughout the project. RFI responses shall be provided within five (5) business days.

1. Prepare the log in chronological order. Provide the following information not limited to:

a. RFI
b. Subject / Description.
c. Subcontractor involved.
d. Specification / Drawing referenced.
e. Date received from CONTRACTOR.
f. Date returned to CONTRACTOR.
g. Response / Resolution.
g. Number of days under review.

B. Distribution: Following Owner's response to the initial submittal, print, upload the excel spreadsheet to FTP site and distribute copies to the Owner's Representative, E/A, Owner, subcontractors, suppliers, and other parties. 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."

C. RFI Log Updating: Revise the log after each meeting or activity where revisions have been recognized or made. Issue the updated log concurrently with the report of each meeting, or as requested by the E/A.

### 3.14 CHANGE ORDER LOG

A. The CONTRACTOR will be responsible for providing and updating a Change Order Log throughout the project.

1. Prepare the log in chronological order. Provide the following information not limited to:

a. Reference number.
b. RFP number.
c. Description.

d. Subcontractors involved.
e. Current status.
f. Date requested by OWNER.
g. Response from CONTRACTOR info: date, amount, and additional/deletion days.
h. Response to CONTRACTOR info: date, amount, and additional/deletion days.
i. Change Order number to be used for item.
j. Change Order information: date, amount, additional/deletion of days.

B. Distribution: Following Owner's response to the initial submittal, print, upload the Excel spreadsheet to FTP site and distribute copies to the Owner's Representative, E/A, Owner, subcontractors, suppliers, and other parties. 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."

C. Change Order Log Updating: Revise the log after each meeting or activity where revisions have been recognized or made. Issue the updated log concurrently with the report of each meeting, or as requested by the E/A.

## 3.15 ASSET MANAGEMENT TRACKING FORM

"The Owner will provide asset tags for equipment and the CONTRACTOR will be responsible for affixing the tags on the equipment. The CONTRACTOR shall not affix asset management tags until Owner has accepted the installation.

The CONTRACTOR shall work with the ENGINEER and owner to complete and submit the Asset Management Tracking Form included in the project manual. This warranty/equipment list must be broken down in sufficient detail and approved by owner. Asset management tag numbers along with warranty information shall be tracked using the form provided and submitted with the required affidavits at the completion of the project. The Excel file of the form included will be provided to the CONTRACTOR upon request. The electronic file as well as hard copies shall be provided to the Owner as required by the Specifications."

# 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 |

Example

**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**

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# 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. (http://www.engineoff.org/)

**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://data.capcog.org/air-quality/engineoff/AntiIdlingBrochure(2).pdf)

(http://data.capcog.org/air-quality/engineoff/template-1/HowtoOrderSign.html)

(http://data.capcog.org/air-quality/engineoff/smartwaycalculator.xls)

(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.** Eliminate use of vehicles in tier 0 and 1 categories per EPA and rent or purchase tier 2 and 3 or (4) compliant vehicles.

**9.** 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)

**10.** 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)

**C-4 Maintenance Program:**

**11.** Establish a preventative **maintenance program** addressing issues including but not limited to, fuel use, air emissions, tire pressure, smoke from exhaust and noise.

**12.** Make all efforts to **prevent oil/fuel spillage** on to site surfaces.

**C-5 Resource Management:**

13. Utilize equipment companies that are located closest to the construction site.

14. Store equipment on site during construction use or arrange for closest overnight storage including **temporary use of the Right of Way** if possible.

15. To the extent possible, CONTRACTOR shall maximize use of **local and regional materials** to reduce transportation emissions.

16. CONTRACTOR shall maximize **salvage and reuse** of appropriate on-site materials. (http://www.usgbc.org/ShowFile.aspx?DocumentID=1095)

17. 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.

**END**

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## 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 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

## 3.2. 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 daily as specified Section 01300.

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.

## 3.3 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.

## 3.4 ADDITIONAL ASSET PHOTOGRAPHS

INFRASTRUCTURE FACILITIES (I.E. TREATMENT PLANTS, PUMP STATIONS, LIFT STATIONS, RESERVOIRS, ETC)

Additional asset photographs shall be taken to show, identify and locate AWU's assets as they are being installed as part of the work. The quantity of asset photos required is determined by the number of asset items added to AWU's Computerized Maintenance Management System (CMMS) data base as part of the construction of this project. A specific complete list of assets to be installed within this contract is identified in the Submittals Section of the Contract (Section 01300).

Asset photograph shall be digital time stamped photographs, submitted within the PDF Construction Diary, as specified in Section 01300.

Each print of the asset shall be marked with the following information:

- The CIP ID number for the Contract
- Name of CONTRACTOR
- AWU's CMMS asset number
- The date of installation of the asset
- Location of asset (i.e. Sta. number, or State Plane Coordinate number, or other suitable information identifying where the asset was installed)

Each asset photograph must be included in an Asset Management Photo Log that indicates the AWU CMMS asset number, the CIP ID number of Contract, name of CONTRACTOR, the date of the photograph and the filename that the camera assigns to the photo (e.g. MVC-001.jpg).

**End**

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# SECTION 01480
# TIGHTNESS TESTING OF LIQUID RETAINING STRUCTURES

## PART 1 GENERAL

### 1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and perform tightness testing of cast in place reinforced concrete liquid retaining structures listed herein and all retesting until the structures meet the requirements specified herein.

### 1.02 RELATED WORK

A. Concrete for structures and concrete structures are included in Section 403S and 410S.

B. Valves are included in Section 15100.

### 1.03 SUBMITTALS

A. Submit for each structure, in accordance with Section 01300, a detailed plan and schedule which shows the method of filling and disposal of water.

B. Submit, in accordance with Section 01300, a completed Tightness Test Report (Figure A, appended at the end of this Section) of each test for each structure.

### 1.04 REFERENCE STANDARDS

A. American Concrete Institute (ACI)

1. ACI 350.1-01 - Tightness Testing of Environmental Engineering Concrete Structures and Commentary.

B. Where reference is made to the above standard, the revision in effect at the time of bid opening shall apply.

### 1.05 PROJECT/SITE REQUIREMENTS

A. Coordinate timing and procedures for obtaining water for testing, structure testing, and water disposal with the Engineer a minimum of 30 days in advance of the actual testing.

B. Water Source and Disposal

1. Water for testing shall be provided by the Contractor.

2. Test water shall be disposed of by the Contractor in an approved manner. Water shall not be disposed of by discharging it onto the ground surface of public or private land.

## PART 2 PRODUCTS (NOT USED)

# PART 3 EXECUTION

## 3.01 GENERAL

A. The tightness testing of cast in place reinforced concrete liquid retaining structures shall conform to ACI 350.1-01 and as specified herein.

B. Perform tightness tests prior to waterproofing and dampproofing and prior to placing backfill around the structure in order to permit observation and detection of leakage points.

## 3.02 PREPARATION

A. Remove all dirt, mud and debris from the structure prior to initiating tightness tests. The floor and sumps shall be flushed with water to provide a clean surface, ready for testing.

B. Inlet and outlet pipes not required to be operational for the tests shall be temporarily sealed or bulkheaded prior to testing.

C. Confirm that all valves and slide gates are completely closed. Repair and reset seals if necessary. All valves, and slide gates shall be tested for leakage in accordance with the requirements of the respective Sections as part of the preparation for final tightness testing under this Section. Estimates of gate or valve leakage will not be allowed as adjustments to the measured structure leakage.

## 3.03 EXAMINATION

A. Inspect the structure to be tested for potential leakage paths including cracks, voids, honeycombs, and unsealed joints and repair such paths as directed by the Engineer, at no additional cost to the Owner.

## 3.04 TESTING PROCEDURES

A. Conditions of Testing

1. Do not begin filling of reinforced concrete structure until all concrete elements of the structure have attained the minimum specified 28-day compressive strength, nor less than 14 days after all concrete elements have been placed.

2. Initial filling of reinforced concrete structure shall not exceed a rate of 2-ft per hour.

3. Fill reinforced concrete structure to the maximum operating water surface level and maintain the water at that level for at least 72 hours prior to beginning tightness tests to minimize water absorption by the concrete during testing.

4. Test only a single structure at a time. Concurrent testing of contiguous or adjacent structures will not be allowed. For the purpose of tightness testing a single structure is any tank, wet well, basin, cell, compartment, filter, channel or similar construction which may be isolated by gates, valves, stop plates or the like such that it may be full of liquid when adjacent construction is empty.

B. Testing Procedures

1. Duration of the test shall not be less than the time required to produce a drop in the water surface of 1/2-in based on the calculated maximum allowable leakage rate or 3 days, whichever is greater.

2. Measure water surface elevations at 24 hour intervals. Measure water surface elevations at the same four locations 90 degrees apart. Record water temperature 18-in below the water surface when taking the first and last sets of measurements. The methods used to determine the amount of precipitation or evaporation shall be approved by the Engineer.

3. The percentage of water volume loss shall be computed based on the measured change in water surface elevation, the area of the horizontal water surface, the initial water volume and any correction for precipitation or evaporation where applicable.

C. Reports

1. Notify the Engineer of the scheduling of tests 30 working days prior to the tests. The Engineer may monitor any tightness testing performed on the structures.

2. Submit a completed Tightness Test Report on the form appended to this Section for each structure tested.

3.05 ACCEPTANCE

A. The following conditions shall be considered as NOT meeting the criteria for acceptance regardless of the actual loss of water volume from the structure.

1. Groundwater seeping or flowing into the structure through floors, walls, or wall-floor joints.

2. Structures which exhibit seeping or flowing water from joints, cracks, voids, honeycombs, or from beneath the foundation.

3. Moisture can be deposited on a dry hand held against the exterior surface of the structure.

B. The tightness of concrete tanks and structures shall be considered acceptable when the conditions of Paragraph 3.05 A are not present and when loss of water volume is within the criteria listed below:

1. For unlined (or partially lined) reinforced concrete tanks, loss of volume not exceeding 0.10 percent in 24 hours (HST-100).

2. For reinforced concrete tanks with fully lined walls, loss of volume not exceeding 0.05 percent in 24 hours (HST-050).

3.06 REPAIRS AND RETESTING

A. Structures failing the tightness test and not exhibiting visible leakage may be retested after an additional stabilization period of 7 days. Structures failing this second test shall be repaired at no additional cost to the Owner prior to further testing.

B. Repaired structures shall be retested. Repairs and retesting shall be conducted at no additional cost to the Owner and shall be continued and repeated until the structure meets all requirements specified herein.

3.07 SCHEDULE

A. The following structures shall be tested for tightness:

1. Gravity thickener scum wet wells

2. Gravity thickener effluent boxes

END OF SECTION

FIGURE A
TIGHTNESS TEST REPORT

PROJECT _____ SUBMITTED BY_____
STRUCTURE* _____ TEST DATES _____
Allowable loss of water volume _____ percent in 24 hrs.
Measured loss of water volume _____ percent in 24 hrs. (From D below)
TEST READINGS
Water temperature at start _____ degrees F
Water temperature at end _____ degrees F

Water Surface Elevation

| | Date | Time | Location 1 | Location 2 | Location 3 | Location 4 | Initials |
|---|---|---|---|---|---|---|---|
| 1. | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| 2. | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| 3. | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| 4. | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| 5. | _____ | _____ | _____ | _____ | _____ | _____ | _____ |
| Change in level | | _____ | _____ | _____ | _____ | _____ | _____ |

| | | |
|---|---|---|
| A. | Average change in level | _____ |
| B. | Correction for precipitation/evaporation | _____ |
| C. | Corrected change in level = CL = | _____ |
| D. | Measured percent water loss in 24 hrs. = | (CL) x (surface area) x (100) / (initial water volume) (number of test days) |

Notes and field observations**

* Attach a sketch showing a plan of the structure and measurement locations.
** Place date and initials at the beginning of each entry.

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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.

In addition, CONTRACTOR shall provide a suitable field office with at least 200 square feet of floor space, either adjacent to, or partitioned off from, his office at the site for use by Owner's Representative. The office shall be provided with outside entrance door with a substantial lock, glazed windows suitable for light and ventilation, and adequate heating, air conditioning, and lighting facilities. CONTRACTOR shall pay all electricity and heating bills and shall provide telephone services with a telephone as specified hereinafter. The office shall be furnished with a desk, two four-drawer filing cabinets, a table, two chairs, a plan rack, and a locker for storage of surveying instruments. The doors on the locker shall be equipped for padlocking. The general arrangement of the office and facilities provided shall be acceptable to Owner's Representative.

### 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. Siltation and/or sedimentation

controls shall include dams, berms, and dikes as recommended in the "Environmental Criteria Manual".

### 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<br><br>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)<br>http://www.osha.gov/Publications/osha3167.pdf (Spanish) |
| City of Austin Rest Break Ordinance Signs | http://austintexas.gov/department/wage-compliance (English and Spanish)<br>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)<br>http://www.twc.state.tx.us/ui/lablaw/ll10s.pdf (Spanish) |
| Texas Workers Compensation notice that the employer does or does not carry Workers | Does not carry Workers Compensation Insurance:<br>http://www.tdi.state.tx.us/forms/dwc/notice5.pdf (English)<br>http://www.tdi.state.tx.us/forms/dwc/notice5s.pdf (Spanish) |

| | |
|---|---|
| Compensation insurance | Does carry Workers Compensation Insurance:<br>http://www.tdi.state.tx.us/forms/dwc/notice6.pdf (English)<br>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)<br>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)<br>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<br>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)<br>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)<br>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<br><br>(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) |

**END**

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**Non-Building Projects – Water/Wastewater and Street Reconstruction**

## 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 01700 "Contract Closeout"
4. Division 01 Section 01710 "Final Cleaning"

### 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. See 1.5 Waste Management Goals.

1. All profits resulting from salvaging and recycling shall go to the Contractor.
2. Where there is little 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

### 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 as much as is economically feasible 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, 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 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 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.

d. Identify location of temporary on-Site storage for recycled and reused materials.

e. Identify final destination means of transportation for each recycled and reused material.

f. Identify the name/phone number of the Contractor's on-site coordinator of the Waste Management Plan.

g. Indicate permit or license and the location of the municipal solid waste landfills and other disposal area(s) to be used.

h. List of materials that cannot be recycled or reused.

**B.** ***Construction Waste Management 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 and Quantity

3. Indicate whether recycled, salvaged, reused of sent to landfill for disposal.
4. Destination or Name and location of accepting facility.

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.** 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 contractor is encouraged to recycle the following types of construction waste materials generated during the course of this project, that are not salvaged or reused:

a. Asphalt concrete pavement.

b. Concrete materials.

c. Metals, including the following.

i. Banding straps.
ii. Reinforcing steel.
iii. Iron.
iv. Steel pipe.
v. Galvanized steel pipe.

d. Clean dimensional lumber.

e. Wood crates and pallets.

f. Glass and glass containers.

g. Plastics.

h. Electrical wiring.

i. Cardboard, paper, and packaging.

j. 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.

d. 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 Guidelines:

1. The contractor is encouraged to 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 as much land-clearing and construction waste as is economically feasible.*

### 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?

_____
_____
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**b.** Which employees and / or subcontractors will be involved with each technique?

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## 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), 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 |
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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 |
|---|---|---|
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## 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 | | | | | | |
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Signature _____ Date _____

**Page / of / total pages**

**END SECTION 01505**

## 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**

## 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.

**If Project Manager elects to allow blasting on a Project, a special section in Division 1 shall need to be developed by the Project Manager.**

### 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**

# SECTION 01600
# MATERIALS AND EQUIPMENT

## PART 1 GENERAL

### 1.01 SCOPE OF WORK

A. This Section specifies the general requirements for the delivery handling, storage and protection for all items required in the construction of the work. Specific requirements, if any, are specified with the related item.

### 1.02 TRANSPORTATION AND DELIVERY

A. Transport and handle items in accordance with manufacturer's instructions.

B. Schedule delivery to reduce long term on-site storage prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than one month prior to installation without written authorization from the Engineer.

C. Coordinate delivery with installation to ensure minimum holding time for items that are hazardous, flammable, easily damaged or sensitive to deterioration.

D. Deliver products to the site in manufacturer's original sealed containers or other packing systems, complete with instructions for handling, storing, unpacking, protecting and installing.

E. All items delivered to the site shall be unloaded and placed in a manner which will not hamper the Contractor's normal construction operation or those of subcontractors and other contractors and will not interfere with the flow of necessary traffic.

F. Provide necessary equipment and personnel to unload all items delivered to the site.

G. Promptly inspect shipment to assure that products comply with requirements, quantities are correct and items are undamaged. For items furnished by others (i.e., Owner, other Contractors), perform inspection in the presence of the Engineer. Notify Engineer verbally, and in writing, of any problems.

H. If any item has been damaged, such damage shall be repaired at no additional cost to the Owner.

### 1.03 STORAGE AND PROTECTION

A. Store and protect products in accordance with the manufacturer's instructions, with seals and labels intact and legible. Storage instruction shall be studied by the Contractor and reviewed with the Engineer by him/her. Instruction shall be carefully followed and a written record of this kept by the Contractor. Arrange storage to permit access for inspection.

B. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

C. Cement and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural, miscellaneous and reinforcing steel shall be stored off the ground or otherwise to prevent accumulations of dirt or grease and in a position to prevent

accumulations of standing water and to minimize rusting. Beams shall be stored with the webs vertical. Precast concrete shall be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping or cracking. Brick, block and similar masonry products shall be handled and stored in a manner to reduce breakage, cracking and spalling to a minimum.

D. All mechanical and electrical equipment and instruments subject to corrosive damage by the atmosphere if stored outdoors (even though covered by canvas) shall be stored in a weathertight building to prevent injury. The building may be a temporary structure on the site or elsewhere, but it must be satisfactory to the Engineer. Building shall be provided with adequate ventilation to prevent condensation. Maintain temperature and humidity within range required by manufacturer.

1. All equipment shall be stored fully lubricated with oil, grease and other lubricants unless otherwise instructed by the manufacturer.

2. Moving parts shall be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment, at least half load, once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.

3. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment at the time of acceptance.

4. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guaranty the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.

E. All paint and other coating products shall be stored in areas protected from the weather. Follow all storage requirements set forth by the paint and coating manufacturers.

END OF SECTION

# SECTION 01650
# FACILITY STARTUP/COMMISSIONING

## PART 1 GENERAL

### 1.01 COMMISSIONING SCOPE REQUIREMENTS

A. The work under this Section is subject to requirements of the Contract Documents including the Owner's General Conditions and articles of the Construction Manager's General Conditions.

B. The commissioning process is based on American Society of Heating Refrigeration Air Conditioning Engineers (ASHRAE) Guideline 0-2005, Guideline 1-1996, and the Associated Air Balance Council Commissioning Group (ACG) Commissioning Guideline among other industry standards, but will be tailored to meet the specific needs of the project.

### 1.02 DESCRIPTION

A. Commissioning is a quality driven systematic process of verifying all the commissioned equipment and systems are installed and perform independently and interactively with other systems according to design intent and Owner's operational needs. The commissioning effort will coordinate and implement multiple commissioning tasks typically focusing on review of documents, site observations, and testing verification to the commissioned equipment and systems.

B. The proposed scope of work or the commissioning process does not replace or reduce the responsibility of system designer engineers, installing contractors, sub-contractors, or suppliers in performing all aspects of work and testing as outlined in the contract documents in providing a finished and fully functioning product and system.

C. The CxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management.

### 1.03 DEFINITIONS

A. The following are commonly used definitions of words used in the specifications.

1. Acceptance - A formal action, taken by a person with appropriate provider (which may or may not be contractually defined) to declare that some aspect of the project meets defined requirements, thus permitting subsequent activities to proceed.

2. Approval - Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.

3. Contract Documents - Construction drawings, specifications, Addendums, request for information (RFI) documents and other proprietary contract altering document associated with the project.

4. Commissioning Team – The commissioning team will consist of the commissioning agent, architect/engineer, construction manager or general contractor, owner, sub-contractors, equipment vendors, manufacturers representative, controls contractor, test and balance contractor.

5. Deficiency – A condition in the installation or function of the component, piece of equipment or system that is not in compliance with the contract documents, does not perform properly, or is not complying with the design intent.

6. Design Intent – The Design Intent is an explanation of ideas, concepts, ands criteria that are considered to be very important to the Owner. It is initially the outcome of the programming and conceptual design phases.

7. Manufacturer's Representative – A representative of the company building and supplying the equipment to the project.

8. Vendor – The supplier of the equipment.

1.04 ABBREVIATIONS

A. The following are commonly used Abbreviations used in the specifications

1. A/E – Architect / Engineers

2. CM/GC – Construction Manager or General Contractor

3. Cx - Commissioning

4. CxA – Commissioning Agent

5. FPT – Functional Performance tests

6. HVAC – Heating Ventilation & Air Conditioning

7. IRL – Issues Resolution Log

8. LC – LEED Consultant

9. LEED – Leadership in Energy and Environmental Design

10. MEL – Master Equipment List

11. O&M – Operation and Maintenance

12. OPR – Owner's Project Requirements

13. PFC – Pre-Functional Performance Checklist

14. PUR – Project Update Report

15. RFI – Request for Information

16. SVR – Site Visit Report

17. TAB – Test and Balance

18. VE – Value Engineering

1.05 RELATED WORK

A. Specific General Commissioning and Mechanical specification sections.

1.06 RESPONSIBILITIES OF THE COMMISSIONING TEAM MEMBERS

A. Architect/Engineer:

1. Delivery of or access to the electronic copies of the required construction drawings to the CxA to meet the needs of the commissioning process.

2. Delivery of or access to the electronic copies to the CxA of the project specifications document and all other contract altering documents including but not limited to any issued addendums, RFI's, or scope of work changes of any kind through the term of the contract.

3. Attend the commissioning kick-off meeting.

4. The A/E is to submit to the CxA a copy of the submittal that the engineer has approved. Any rejected submittals or any submittals the engineer has requested a resubmission will not be reviewed by the CxA, only the approved submittal will be reviewed by the CxA. It is recommended the A/E not issue the engineers approved submittal back to the CM/GC until the CxA has completed their review of the submittal in the event the CxA finds an issue related to the submittal.

B. Construction Manager or General Contractor

1. The CM/GC is to ensure all sub-contractors execute their commissioning responsibilities in accordance to the contract documents in a timely manner.

2. Submit to the CxA the construction schedule and all schedule updates throughout the duration of the project.

3. Submit to the CxA a project directory of owner, client, construction management team, disciplines of each sub-contractor, and A/E design team contacts.

4. Submit to the CxA all RFI's related to the commissioning equipment and systems.

5. Review and comment of the CxA provided Cx Plan.

6. Distribute electronic copies of the CxA provided Cx Plan to the sub-contractors for review and use.

7. Incorporate the commissioning activities provided by the CxA into the construction schedule.

8. Attend the Commissioning Kick-Off meeting and coordinate with the CxA the date of the Commissioning Kick-off meeting.

9. Contact and coordinate having all requested attendees at the Cx Kick-Off Meeting.

10. Attend any scheduled Commissioning meetings.

11. Submit to the CxA the following documents from the sub-contractor:
    a. Submittals for the commissioned equipment.

12. Submit to the CxA the following documents:
    a. Controls sequence of operations based on the 100% construction documents.
    b. Final "as-built" control sequence of operations for the commissioned equipment and systems.

13. Submit to the CxA the dates for the Controls contractor will be completed with the setting up of the control sequence of operations of the commissioned equipment.

14. Promote and assists in the timely responses and resolution by the appropriate trade to the open items on the IRL document.

15. Provide the necessary safety and support personnel to complete testing, including fire watch.

16. Notify the CxA in a timely manner of any major schedule changes, especially related to the commissioned equipment readiness.

C. Owner

1. Review of the Cx Plan when issued and prepare a list of questions for the Commissioning Kick-Off Meeting.

2. Accept all closed items on the Issue Resolution Log (IRL) or provide an Owner's Representative to close IRL items.

3. Provide unobstructed access to all areas and rooms of the building to access commissioned equipment and to perform all agreed upon commission tasks.

D. Subcontractors (Vendor / Manufacturer's Representative)

1. The sub-contractors are responsible for the completion of the following tasks but can rely on the assistance of the equipment vendor and or manufacturer's representative in completing the following tasks.

2. The following does not include the efforts required from the Controls or TAB contractors.

3. Review Commissioning specifications, Cx Plan, Pre-Functional Checklists, and Functional Performance Test procedures.

4. Attend the Commissioning Kick-Off meeting.

5. Review of the Cx Plan when issued and prepare a list of questions for the Commissioning Kick-Off Meeting.
    a. The CxA will be executing the PFC documents. The sub-contractor is to notify the CM/GC when the equipment is ready for the PFC verification process.
    b. All deficiencies documented during the PFC process are to be addressed by the responsible sub-contractor.

6. Participate in the FPT verification process by:
   a. Prior to the CxA executing the FPT verification document the responsible sub-contractor is to use the CxA provided FPT checklist to confirm if the equipment / system is operating as per the process stated in the FPT document. The CxA is not to visit the site and begin the execution of the FPT checklist until the sub-contractor has executed steps in the FPT document.
   b. After the sub-contractor has confirmed the equipment / system is operating as per the FPT document notifies the CM/GC the equipment/ system is ready for the FPT verification process.
   c. Assisting in the FPT verification process with the CxA by providing the necessary equipment and personnel during the execution of the FPT document by the CxA.

E. Controls Contractor:

1. Review of the Cx Plan and prepare a list of questions for the Commissioning Kick-Off Meeting.

2. Attend Commissioning Kick-Off meeting and attend, when requested, the scheduled commissioning meetings.

3. Completely install and thoroughly inspect start-up, test, adjust, calibrate and document systems and equipment under Building Automation/Controls Contract.

4. The controls contractor is to provide documentation that all tools used during the functional testing process have been calibrated.

5. Provide laptop computer, software and training to accommodate Test and Balance Contractor in system balancing.

6. Maintain database of control parameters submitted by Test and Balance Contractor subsequent to field adjustments and measurements.

7. Notify the CM/GC on the dates in which each commissioned equipment and systems are ready for FPT verification. Once notified the CM/GC will rely the dates to the CxA to schedule time for execution of the FPT checklist. The commissioned equipment and systems will be ready for FPT verification when:
   a. The TAB contractor has completed all required testing and balancing.
   b. The controls contractor has declared the control system is operational as per the construction documents and has tested the control sequences for each commissioned equipment using the CxA provided FPT checklist.

8. Provide on-site technician skilled in software programming and hardware operation to exercise sequences of operation and to correct control deficiencies identified during Functional Performance Testing including deferred testing.

9. Provide instrumentation, computer, software and communication resources necessary to demonstrate total operation of building systems during Functional Performance Testing of control system equipment including deferred testing.

10. Prepare and submit the Controls Submittal to the CM/GC. CM/GC will forward the submittal to the CxA.

F. Test, Adjust and Balance Contractor:

1. Review of the Cx Plan when issued and prepare a list of questions for the Commissioning Kick-Off Meeting.

2. Attend Commissioning Kick-Off meeting and attend when requested scheduled commissioning meetings.

3. Assist the Controls Contractor with setting up the sequence of operation for the commissioned equipment and during the FPT verification process.

4. Rebalance deficient areas identified during commissioning.

5. Provide on-site technician and equipment, as necessary, skilled in Test and Balance procedures to provide verification of equipment and system performance during Functional Performance Testing including deferred testing.

6. Provide on-site technician and equipment, as necessary, skilled in Test and Balance procedures to provide verification of the final Test and Balance report. These verification procedures will be executed after the final Test and Balance report has been submitted for review. The Test and Balance subcontractor will recheck a sampling of the final air and water Test and Balance report readings for the CxA (allow a total of 16 hours for the final Test and Balance report verification over a single, two-day site visit).

7. The TAB contractor is to provide documentation that all tools / equipment used during the TAB process have been calibrated within one year of test date.

8. Participate in the FPT process involved with any opposed season and deferred testing process.

G. Commissioning Agent (CxA)

1. CxA shall be provided by the GC/CM.

2. It is the responsibility of the CxA to execute all of the commissioning tasks and activities as described in Section 6 Commissioning Process of this Cx specification.

3. The CxA is to direct activities defined in the Commissioning Plan, thereby verifying implementation of the overall quality process.

4. The CxA will be the lead in the implementation of the commissioning process and as such will be accountable to ensure the process is delivered as defined within the specifications and within the context of the Cx Plan.

## PART 2 SYSTEMS TO BE COMMISSIONED

### 2.01 MECHANICAL

A. Pre- Functional Checklists

1. Air Handling Units

B. Functional Performance Tests

1. Air Handling Unit

PART 3 EXECUTION OF COMMISSIONING TASKS

3.01 CONSTRUCTION PHASE CX TASKS

A. Site Visits

1. Site Visit Process
   a. All site visits to execute any of the Commissioning task will be coordinated through the CM/GC.
   b. Prior to visiting the site the CxA will issue a confirmation email to the CM/GC. The contents of the email will include:
      1) The purpose of the site visit.
      2) The name(s) of the CxA coming to the site.
      3) The list of sub-contractors or others entities required to be at the site with the CxA during execution of the Cx tasks.
      4) A listing of all of requirements and conditions that need to be completed or in place in order to execute the Cx Tasks.

2. The CM/GC is to reply confirming that the sub-contractors or other entities that need to be on site will be on-site and that all of the stated requirements and conditions are in place to execute the Cx tasks.

3. Upon arrival at the site the CxA will check-in with the CM/GC prior to going onto the construction site.

4. After execution of the site visit and before leaving the site the CxA will check-out with the CM/GC for a de-briefing of the results of the Cx tasks. Any deficiencies to be listed on the IRL will be reviewed with the CM/GC during the de-briefing.

5. The CxA will issue after leaving the site and within three business days a Site Visit Report. If the CxA is on-site for more than one week at a time a Site Visit Report will be issued for each week.

B. Non-Executed Site Visits

1. A non-executed site visit is one in which the CxA was informed all requirements were in place for the execution of a test and upon arrival the requirements were not in place and the test was not aborted.

2. A sampling of reasons for non-executed site visit include, but not limited to, the following:
   a. The agreed upon preparatory tasks have not been completed.
   b. The sub-contractor or other entities agreed to have been on-site did not arrive.
   c. The equipment / systems agreed upon as ready for PFC or FPT are not ready for the verification and testing process.
   d. Back-checking of the open IRL items that were declared completed yet upon arrival at the site they have not been completed.

3. A Change Order will need to be executed before returning to the site to conduct the non-executed site visit. The Change Order is to cover the costs of time, travel expenses, preparing reports, attending meetings, and any material associated with the non-execution of the site visit.

4. Follow-up testing will not be executed until the Change Order has been fully execute.

C. Issue Final Commissioning Plan

1. The CxA will develop a Final Commissioning Plan that will serve as the roadmap of how the commissioning process will be implemented. The document will contain guidance for the participants involved, their roles and responsibilities, and direction for scheduling, implementation, testing, reporting and documentation of the various stages of the Cx process. This plan should be incorporated into the overall construction documents so that all parties in the construction process are informed regarding commissioning. The Plan will be distributed to the Commissioning Team for review and comment. The Commissioning Plan will be used by the Commissioning Authority to execute the commissioning process.
   a. An electronic copy of the Cx Plan will be submitted to the CM/GC for distribution to the Owner and all sub-contractors involved with the commissioning process.

D. Commissioning Kick-off Meeting

1. The CxA will coordinate, schedule, and conduct a Cx Kick-Off Meeting after construction has been initiated and no later than 30 days prior to the first Cx site visit or earlier if deemed necessary by the CxA.

2. The CxA will coordinate the date and time of the meeting with the CM/GC.

3. The requested attendees at the meeting are to include, but not limited to, the Owner, Owner's Representative, Client, construction manager, A/E design team, mechanical, electrical, controls, and test & balance sub-contractors and any 3rd party testing firms. Other attendees may be invited at the request of the Owner or Client.

4. The intent and purpose of the Cx Kick-Off meeting is to:
   a. Introduce all CxA team members to Owner, Client, Owner's Representative, CM/GC, and all entities involved with the construction phase of the project.
   b. Review of the Final Cx Plan to explain to the Client and all members of the construction team and design team the:
      1) Commissioning process;
      2) Specific objectives of the commissioning process;
      3) Roles and responsibilities of all entities involved with the commissioning process
      4) Commissioning administration process; and
      5) Commissioning scope of work and commissioning tasks during each phase of the project.
   c. Provide a forum for the client, owner, owner's representative and all team members involved in the commissioning process to ask any questions.

5. The agenda of the meeting will be the Final Cx Plan. Prior to the Cx Kick-off Meeting the CxA will issue to the CM/GC the Final Cx Plan. The CM/GC will distribute to all attendees a copy of the Cx Plan.

6. After the Cx Kick-off Meeting the CxA will issue meeting minutes and the sign-in sheet to all attendees and other requested to receive the minutes.

E. Pre-Functional Checklist (PFC) Verification Process / PFC Site Visits

1. Objectives and Scope:
   a. The objective of Pre-Functional Checklists is to verify all equipment and systems to be commissioned are installed according to the Contract Documents.

F. PFC Document Development

1. The project specific PFC's are to be developed by the CxA.

2. The CM/GC will provide drawings and specifications to CxA for the development of the PFC's. Drawing will be provided to the CxA by:
   a. Submitting a hard-copy of the MEP specification and half-size legible drawings.
   b. Providing access to an fpt site housing the MEP drawings and specifications.
   c. Sending an electronic copy of the required drawings and specifications.

G. PFC Verification Site Visits

1. PFC's are to be executed by the CxA.

2. The CxA PFC Site Visits will be coordinated and scheduled with the CM/GC based on the level of installation required for each piece of commissioned equipment.

3. The Pre-Functional Checklist process is initiated for all commissioned equipment requiring piping when the piping is installed but prior to installation of the insulation. The PFC process will be completed prior to equipment start-up and initiation of the FPT process.

4. The Pre-Functional Checklist process is initiated for all commissioned equipment without piping when the equipment is installed and to be completed prior to equipment start-up and initiation of the FPT process.

5. All deficiencies noted during the PFC process will be identified on the IRL.

6. The CxA will issue a Site Visit Report at the conclusion of each PFC site visit or at the end of the each week. Included with the report will be an Issues Resolution Log and photographs.

7. During the PFC verification process the "In-Progress" PFC's will not be submitted unless requested by the Owner or CM/GC. The completed PFC checklists will be included with the issuance of the Final Commissioning Report.

8. Functional Performance Test
   a. Objectives and Scope:
      1) The objective of Functional Performance Testing is to demonstrate the commissioned equipment and system to be commissioned are operating in accordance to the documented design intent and Contract Documents.

2) The Functional Performance Test is a test of the dynamic function and operation of commissioned equipment and systems to verify the equipment is responding according to the engineer's specified sequence of operation.
3) The Functional Performance Test checklists will be project specific checklists and will be developed from the contract documents.
4) The Functional Performance Test process will involve the participation of the controls contractor, testing and balancing agency, and the mechanical, electrical, and plumbing sub-contractors.

b. Functional Performance Test Checklist Process
1) FPT Document Development
a) The project specific FPT's will be developed by the CxA.
b) The Construction Manager will provide drawings, specifications, and the controls sequence of operation submittal to the CxA for the development of the FPT's. The requested documents will be provided to the CxA by:
i. Submitting a hard-copy of the specifications, controls submittal, and legible half-size drawings.
ii. Providing access to a site housing the requested documents.
iii. Sending an electronic copy of the requested documents.
iv. The FPT documents will be available for review prior to use by the Construction Manager, Owner, and sub-contractor.
2) FPT Execution
a) The CxA will be assisted with the execution of the FPT by the controls contractor, testing and balancing agency, and the mechanical, electrical, and plumbing sub-contractors.
b) The CxA FPT Site Visits will be coordinated and scheduled with the Construction Manager.
c) The execution of the FPT documents will be initiated after the following tasks are completed:
i. The PFC documents are completed and all open deficiencies affecting the TAB process or the operation of the equipment and systems have been closed.
ii. Start-Up of the commissioned equipment completed.
iii. TAB contractor declares the TAB process is completed.
iv. Controls contractor declares the controls sequence of operation for each of the commissioned equipment and systems are setup and operating as per the contract documents.
d) All deficiencies noted during the FPT process will be identified on the IRL.
e) The CxA will issue a Site Visit Report at the conclusion of each site visit or at the end of the each week. Included with the report will be an Issues Resolution Log and photographs.
f) During the Functional Performance Test verification process the "In-Progress" Functional Performance Test checklists will not be submitted unless requested by the Owner or CM/GC. The completed FPT checklists will be included with the issuance of the Final Commissioning Report.
g) Division contractors shall provide all specialized tools, test equipment and instruments required to the Functional Performance Testing of equipment under their contract.
h) Test equipment shall be of sufficient quality and accuracy to test and/or measure system performance with tolerances specified. A testing laboratory shall have calibrated test equipment within the previous 12 months. Equipment shall be calibrated according to manufacturer's recommended

intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

i) The functional testing shall be conducted by the contractor or vendor as many times as necessary to successfully demonstrate to the satisfaction of the CxA and Owner that the specified design criteria have been achieved. *The CxA may request additional compensation upon the 3rd attempt of testing event.*

3.02 OCCUPANCY PHASE COMMISSIONING TASKS

A. Final Commissioning Report

1. A Final Commissioning Report will be compiled by the CxA and issued at the completion of the Acceptance Phase.

2. One electronic copy of the Final Commissioning Report will be submitted to the CxA primary point of contact as well as "others" as decided upon by the CxA. "Others" can be the directed by the CxA Client, Owner, Owner / Owners Representative, etc.

3. The contents of the Final Commissioning Report will include, as minimum, the following:
   a. Executive Summary Narrative
   b. Outstanding Issues
   c. Commissioning Activities
   d. Site Visit Reports
   e. Appendix
      1) Appendix to include all completed commissioning task documents.

PART 4 COMMISSIONING DOCUMENTATION

4.01 SITE VISIT REPORT (SVR)

A. The CxA will visit the site and write a SVR to document the results of the following in-field Cx tasks:

1. PFC Site Visits

2. FPT Site Visits

B. After each site visit a SVR will submitted to the CM/GC within three working days and will typically include who was on site, purpose of the site visit, finding observed during the site visit, and the next field commissioning task to be completed.

C. If the site visit is to perform Pre-Functional Checklist or Functional Performance Testing a copy of the Commissioning Deficiency List and photographs will be included as part of the SVR.

D. After each site visit a SVR will be issued to the CM/GC and distributed at the discretion of the CM/GC to all necessary entities.

4.02 ISSUE RESOLUTION LIST (IRL)

A. The IRL is a list of deficient items observed during the commissioning process that were observed not to be in compliance with the construction documents, not per industry standards, or a possible code violation.

B. All Deficiency List items require a response from the responsible party. All responses are to be submitted to the CxA.

C. All items on the list will remain on the Deficiency List until the deficiency has been resolved or if the deficiency noted is not valid due to value engineering or due to other means of deviation from the construction documents. Once resolved, the deficiency will be closed.

D. If there are any deficiencies open at the completion of the project these items will be noted in the Final Report as unresolved issues. If the project includes a Warranty Review during the occupancy phase the open deficient items will be addressed during this time to confirm if the items have been resolved or not.

E. *NOTE: Any issues affecting system performance must be resolved prior to functional testing of the equipment or system with the deficiency.

F. All final decisions for the corrective item will be made by the engineer of record.

G. The contract includes troubleshooting efforts to be conducted during regularly scheduled commissioning site visits or via teleconference. All site visits with the sole intent of troubleshooting is not part of this contract and will be pursued as a Change Order.

4.03 COMMISSIONING DELIVERABLES

A. Commission Plan

B. Commissioning Kick-off meeting

C. Commissioning Meeting Minutes

D. Construction Meeting minutes of Commissioning related topics

E. PFC Site Visit Reports including IRL and photographs

F. FPT Site Visit reports including IRL and photographs

END OF SECTION

# SECTION 01666
# TESTING OF PIPELINES

## PART 1 GENERAL

### 1.01 SCOPE OF WORK

A. Furnish all labor, materials, tools, equipment and related items required to perform exfiltration testing and deflection testing of flexible gravity pipelines and to perform pressure and leakage testing of pressure pipelines.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

### 3.01 GENERAL

A. The entire length of the installed gravity lines and pressure lines shall be field tested for water tightness.

B. Hydrostatic pressure and leakage tests shall be made on all pressure pipelines carrying water and wastewater.

C. All labor and equipment, including test pump with regulated by-pass meters and gauges required for conducting pipeline tests, shall be furnished by the Contractor. The Contractor shall furnish equipment and necessary piping as required to transport water used in testing from source to test location.

D. Time and sequence of testing shall be scheduled by the Contractor, subject to observation and approval by the Owner. The Contractor shall provide adequate labor, tools and equipment to operate valves and to locate and repair any leaks discovered during the initial filling of the pipeline prior to actual testing or during the course of the tests.

### 3.02 CLEANING

A. At the conclusion of the work, thoroughly clean all pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material which may have entered the pipes during the construction period. Debris cleaned from the lines shall be removed from the low end of the pipeline. If after this cleaning, obstructions remain, they shall be removed. After the pipelines are cleaned and if the groundwater level is above the pipe or following a heavy rain, the Engineer will examine the pipes for leaks. If any defective pipes or joints are discovered, they shall be repaired.

### 3.03 TEST PROCEDURES FOR GRAVITY PIPELINES

A. Gravity Pipelines, General. Gravity pipelines shall be installed and backfilled and then tested using either Exfiltration Water Testing or Low Pressure Air Testing, and flexible pipes tested using an Allowable Deflection Test.

1. Exfiltration Water Testing
   a. The section of pipe to be tested shall be filled with water and allowed to stand for such time as is required for the pipeline to adsorb such water as it will and for the escape of all air from the line. The sections undergoing test shall be carefully examined for leakage. All known leaks shall be repaired, regardless of these test requirements.
   b. The line shall then be filled to a reference level in manhole or in a reservoir of sufficient capacity to allow for a reference level to be established. The reservoir must be of sufficient capacity as to not allow the water level to drop below the crown of the pipe during the 24-hour test period. If the water level drops below the crown of the pipe, the test shall be voided and run again or until such time the water level is maintained above the crown throughout the duration of the test.
   c. At the end of a 24-hour period, water, if needed, shall be added to the line to bring the water level back to the referenced line. All water added shall be accurately measured by an approved water meter so that an exfiltration rate can be established.
   d. Leakage during the above test shall not exceed a rate equal to 25 gallons per inch of internal diameter per mile per 24 hours.
   e. All observed leaks shall be repaired regardless of the measured leakage rate.

2. Low Pressure Air Testing
   a. This test shall conform to the procedure described in ASTM C828, ASTM C924 or other appropriate procedures. For safety reasons, air testing of sections of pipe shall be limited to lines less than 36-inch average inside diameter. Lines 36-inch average inside diameter and larger may be air tested at each joint. The minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge during a joint test, regardless of pipe size, shall be 20 seconds. For sections of pipe less than 36-inch average inside diameter, the maximum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be computed by the following equation:

$$T = 0.085\ (D)\ (K)\ /\ (Q)$$

   where T = time for pressure to drop 1.0 pounds per square inch gauge in seconds
   K = 0.00049DL, but not less than 1.0
   D = average inside diameter in inches
   L = length of line of same pipe size being tested in feet
   Q = rate of loss, assume 0.0015 $ft^3$/min/sq.ft. internal surface

   b. Minimum testing time for different pipe diameters are listed in the following table. Testing time for 16” pipes shall be the same as for 15” pipes. Testing time for 8” pipes shall be the same as for 15” pipes.

**MINIMUM TESTING TIMES FOR LOW-PRESSURE AIR TEST**

| **Pipe Diameter** (inches) *D* | **Minimum Time of Testing** (seconds) $t_{MINIMUM}$ | **Minimum Length of Pipe** (feet) $L_{MINIMUM}$ | **Time for Longer Length of Pipe** (seconds) $t_{FOR\ LONGER\ THAN\ MINIMUM\ LENGTH}$ |
|---|---|---|---|
| 6 | 398 | 398 | 1.00(L) |
| 8 | 530 | 298 | 1.78(L) |
| 10 | 664 | 239 | 2.78(L) |

**MINIMUM TESTING TIMES FOR LOW-PRESSURE AIR TEST**

| **Pipe Diameter** (inches) *D* | **Minimum Time of Testing** (seconds) $t_{MINIMUM}$ | **Minimum Length of Pipe** (feet) $L_{MINIMUM}$ | **Time for Longer Length of Pipe** (seconds) $t_{FOR\ LONGER\ THAN\ MINIMUM\ LENGTH}$ |
|---|---|---|---|
| 12 | 796 | 199 | 4.00(L) |
| 15 | 993 | 159 | 6.25(L) |
| 20 | 1,322 | 119 | 11.11(L) |

c. Observed leaks shall be repaired regardless of the air test results.

3. Allowable Deflection Test
   a. Pipe deflection testing shall be conducted on all gravity pipes constructed of flexible materials (PVC or other plastic materials).
   b. Pipe deflection measured not less than ninety (90) days after the backfill has been completed as specified shall not exceed five (5.0) percent. Deflection shall be computed by multiplying the amount of deflection (nominal diameter less minimum diameter when measured) by 100 and dividing by the nominal diameter of the pipe.
   c. Deflection shall be measured with a rigid mandrel (Go/No-Go) device cylindrical in shape and constructed with a minimum of nine or ten evenly shaped arms or prongs. Drawings of the mandrel with complete dimensions shall be submitted to the Engineer for each diameter of pipe to be tested. The mandrel shall be hand pulled by the Contractor through all sewer lines.
   d. Any section of sewer not passing the mandrel shall be uncovered at the Contractor's expense and the bedding and backfill replaced to prevent excessive deflection. Repaired pipe shall be retested.

## 3.04 TEST PROCEDURES FOR PRESSURE PIPELINES

### A. General

1. After the pipe has been laid and backfilled and the backfill has been otherwise consolidated, all newly laid pipe, or any valved section thereof, shall be subjected to the hydrostatic pressure specified below for that particular type of pipe. The duration of each pressure test shall be at least one hour and each leakage test, at least four hours, unless otherwise specified or noted on the Drawings. All meters, fixtures, devices or appliances which are connected to the pipeline system and which might be damaged if subjected to the specified test pressure shall be disconnected and the ends of the branch lines plugged or capped during the testing procedures.

2. Each valved (capped or plugged) section of pipe shall be filled slowly with water and all air shall be expelled. If permanent air vents are not located at all high points, the Contractor shall install corporation or blow-off cocks at such points so that air can be expelled as filling takes place. After verification that all air has been expelled, the cocks shall be closed and the pipe kept filled until tested. All exposed pipe, fittings, valves, hydrants and joints shall be examined while under test pressure and all visible leaks shall be stopped. Any cracked or defective pipe, fittings, valves or hydrants discovered during testing shall be removed and replaced by the Contractor. Replacement shall be with sound material and the test shall be repeated until satisfactory to the Owner.

B. Special Requirements. Where any section of pipeline is provided with concrete thrust blocking, the hydrostatic pressure test shall not be made until at least 5 days have elapsed after installation of the blocking. However, if high-early-strength cement is used in the concrete, 2 days shall have elapsed prior to testing.

C. Pressure Tests

1. After compliance with all applicable procedures described above, pressure of 150 percent of the pipe's design pressure but not more than the pressure indicated below nor less than the pressure indicated below shall be applied, unless another test pressure is specified for the type of pipe being tested. This pressure, based on the lowest point of the line or section under test, shall be corrected to the relative elevation of the test gauge and the pressure maintained for a period of not less than one (1) hour.

| **Piping Description** | **Max. Test Pressure** | **Min. Test Pressure** |
|---|---|---|
| Process Piping (pumped)<br>(Including, but not limited to: TSC, SL*) | 50 psi | 30 psi |
| Process Piping (gravity flow)<br>(Including, but not limited to: PD) | 30 psi | 20 psi |
| Non Potable Water (NPW) | 150 psi | 135 psi |

*Overhead SL and TSC piping, that deposits sludge and scum in the Sludge Holding Tank in the Sludge Transfer Building, does not need to be pressure tested. The SL and TSC piping upstream of this overhead piping shall be pressure tested to the most downstream isolation valves.

D. Leakage Tests

1. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain the specified leakage test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

2. Leakage shall be determined by recording the quantity of water pumped into the pipeline through a standard water meter of a size appropriate to secure an accuracy of ±2 percent at the average rate of flow pumped. Leakage rate shall be calculated by extrapolation of the total leakage during the testing period to a 24-hour period. Leakage test pressure shall be at the pressures shown below and test pressure shall be maintained for a period of 4 hours.

| **Piping Description** | **Test Pressure** |
|---|---|
| Non Potable Water | 135 psi |
| Process Piping (pumped) | 30 psi |
| Process Piping (gravity flow) | 20 psi |

3. Allowable leakage for the types of pipe used shall be as follows:
   a. Cast Iron and Ductile Iron. Allowable as permitted by AWWA Standard C-600-82, "Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances", which is not to exceed that determined by the formula:

$$L = (SD \sqrt{P}) / 133{,}200$$

*Where* L is the allowable leakage in gallons per hour, S is the length of pipeline tested in feet, D is the nominal diameter of the pipe in inches, and P is the average test pressure during the leakage tests in pounds per square inch gauge.

4. In the event any section of the line tested fails to meet the above specified requirements for water tightness, the cause of the excessive leakage shall be determined and remedied at the expense of the Contractor, including retesting if required.

3.05 FINAL ACCEPTANCE

A. No pipe installation will be accepted until all known leaks have been repaired whether or not leakage is within allowable limits. Locating and repairing of leaks shall be performed by the Contractor at no additional cost to the Owner.

B. The Owner will certify that all required pressure and leakage tests have been successfully completed before the pipeline is accepted.

3.06 WATER SOURCE

A. Water for testing purposes may be obtained in accordance with Section 01500.

END OF SECTION

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## PART I - GENERAL

### 1.01 SUMMARY

A. This Section specifies the general minimum training requirements associated with equipment and systems installed by the Contract.

B. Training requirements for the various plant components, systems, etc. are described in various sections of the specifications.

C. All costs for training, testing, startup, installation, supervision, etc., shall be the responsibility of the CONTRACTOR.

D. Training is applicable, but not limited to the following equipment and systems specified herein.

### 1.02 RELATED REQUIREMENTS

A. Work as called for on PLANS, and in this or other Specification Sections including 01300 and 01730.

B. This section specifies the general minimum requirements for the contract. Other more specific requirements may be described in various sections of the specifications. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

C. 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 the CONTRACTOR's Work.

D. CONTRACTOR shall develop and administer a training log consisting of all training identified in the Contract. CONTRACTOR shall submit training log for Engineer/OWNER review and approval.

E. Description of Requirements

1. General

a. Contract Requirements: Testing, training, and start-up are prerequisite to the satisfactory completion of the Contract.

b. Complete testing, training, and start-up within the Contract Times.

c. Allow realistic durations in the Progress Schedule for testing, training, and start-up activities.

d. Provide dedicated line item for training in Contract schedule of values.

e. Furnish all labor, materials, equipment, and incidentals necessary to train the OWNER staff on the equipment, products, and systems provided under the Contract.

f. Objective of Training: The objective of the training shall be to convey the knowledge needed by OWNER operations, maintenance, and engineering staff to safely operate, maintain, and repair the equipment and systems provided under this Contract. OWNER's staff who will participate in this training have existing full-time work assignments and this training is an additional assigned work task. OWNER's staff regularly shift work schedules, as facilities are operated on an around-the-clock basis. Training shall be focused to the skills and job classifications of the staff attending the classes, e.g., plant manager, water treatment plant operator, maintenance technician, electrician, and engineering. Supporting documentation, such as training aids, agendas, operation and maintenance manuals to assist the instruction learning process and to serve as a source of information to OWNER staff after training, shall be furnished.

g. CONTRACTOR is required to document all training in dedicated/organized section/manual in the O&M Manual. Including training schedules, agenda, materials, aids, etc.

## 1.03 NOT USED

## 1.04 NOT USED

## 1.05 TRAINING REQUIREMENTS

A. Training of OWNER'S Personnel

1. Instruction Format: The training for operations personnel and for maintenance personnel shall be provided as separate entities. The training for maintenance personnel shall be further subdivided into trade groups: mechanical maintenance, electrical maintenance, SCADA Support, and instrumentation and controls maintenance.

2. Class Agenda: The agenda shall include a listing of subjects to be presented, time estimated for each subject, list of documentation to be used or furnished to support training, and instructor name. Agendas shall include an allocation of time for OWNER staff to ask questions and discuss the subject matter. The OWNER may request that particular subjects be emphasized and the agenda shall be adjusted to accommodate these requests. Copies of the agenda shall be distributed to each student at the beginning of each training class.

3. Number of Students: It is estimated that five (5) to ten (10) persons will attend each training class. The actual number of students will be determined by OWNER. The OWNER will provide an estimated "headcount" one week prior to the class, so that the instructor can furnish the correct number of training aids for participants.

4. Training Location: If necessary and appropriate as determined by the OWNER, training shall be conducted at off-Site locations or the actual installed location of the equipment, product, or system.

5. Instructor Qualifications: Instructors shall be completely knowledgeable in the products, systems, and functions for the equipment provided. Sales representatives are not qualified instructors unless they possess the detailed operating and maintenance knowledge required for proper class instruction. If, in the opinion of the OWNER, the scheduled training was not provided by

an appropriately knowledgeable person, such training shall be rescheduled and repeated with a suitable instructor at no additional cost to the OWNER.

6. Training Aids: Each instructor is encouraged to use audio-visual devices, P&IDs, models, charts, and so forth to increase the transfer of knowledge. The organization conducting the training shall furnish all such equipment (televisions, video cassette recorder/player, projectors, screens, easels, etc.), models, and charts for each class. It shall be the responsibility of the organization conducting the training to confirm in advance that the class room will be appropriate for the types of audio visual equipment to be employed.

7. Classroom Documentation: If training is being completed on equipment, systems, or products for which an operations and maintenance manual is required, this operations and maintenance manual shall be complete and be used during the classroom instruction. The quantity of operations and maintenance manuals required under Section 01730 – O&M, shall be available for classroom use supplied by training instructor. Supplemental documentation handouts shall be furnished to support instruction. All written materials shall be identified with the name of the training module, subject matter, date of training, and instructor name.

8. Testing: Test OWNER operation and maintenance personnel following the completion of operational and safety training. The purpose of this testing shall be to determine the effectiveness of the training program and to determine the ability of OWNER personnel to safely operate and maintain said processes. Testing shall be comprised of multiple choice and true/false questions. Test results for each attendee shall be turned over to the OWNER.

9. Safety and Health Training: Furnish safety and health training to OWNER personnel that describe the procedures required to safely and healthfully operate and maintain the equipment. Safety and health training shall also include standard procedures for emergency response and safe shutdown of equipment in emergency conditions. Incorporate appropriate OSHA regulations including personal protective equipment and its use and other means of injury and illness prevention such as precautions and engineering controls.

10. Videotaping: The CONTRACTOR shall videotape all training sessions and provide a copy for the OWNER. OWNER reserves the right to videotape, photograph, audio record, and otherwise document any or all training classes. The organization(s) conducting the training and the CONTRACTOR shall cooperate with OWNER in making such videotapes, photographs, or audio recordings, which shall remain the exclusive property of OWNER.

11. Point of Contact: The CONTRACTOR shall designate and provide one or more persons to be responsible for coordinating and expediting his/her training duties. The person or persons so designated shall be present at all training coordination meetings with the OWNER.

## 1.06 SUBMITTALS

A. Prior to scheduling training, all satisfactory functional testing must be complete for that piece of equipment or system.

B. Submit written training plan to OWNER for review and approval prior to conducting training including the following:

1. Equipment included in training session.

2. Intended audience.

3. Location of training.

4. Objectives.

5. Subjects covered.

6. Duration of training on each subject.

7. Instructor for each subject.

8. Instructional methods to be used.

C. Prior to scheduling training, Instructor name and qualifications shall be submitted not less than one (1) month prior to start of training. Instructors shall be completely knowledgeable in the products, systems, and functions for the equipment provided.

D. Prior to scheduling training, the CONTRACTOR's coordinator shall coordinate the training periods with OWNER personnel and manufacturer's representatives, and shall submit a training schedule and agenda for each piece of equipment or system for which training is to be provided. Such training schedule and agenda shall be submitted not less than four (4) weeks prior to the time that the associated training is to be provided and shall be based on the current plan of operation.

E. Prior to scheduling training, all course materials must be submitted, and approved.

F. Prior to scheduling training, all relevant O&M manuals must be submitted, and approved one (1) month prior to training session for that piece of equipment or system.

**1.07-1.11 NOT USED**

**<u>PART II - PRODUCTS (NOT USED)</u>**

**<u>PART III - EXECUTION</u>**

**3.01-3.08 NOT USED**

**3.09 SCHEDULING OF TRAINING**

A. Unless specifically indicated otherwise, all training shall be scheduled in accordance with the following general requirements.

1. Training shall not be scheduled until the manufacturer has verified that the equipment is installed and performs properly. Startup services and training services will be required at separate times which will involve separate trips.

2. Coordinate training sessions to prevent overlapping sessions. Arrange sessions so that individual operators and maintenance technicians do not attend more than two (2) sessions per week.

3. Training shall be coordinated in accordance with the Progress Schedule to occur during system installation, startup, and operation. The OWNER will approve and confirm class schedules. The CONTRACTOR shall schedule training classes at the times requested by the OWNER, within the period 7 a.m. to 3 p.m. Monday through Thursday. Classes covering identical material shall be conducted on different days.

4. Number of Classes on Each Subject: A minimum of two (2) classes on identical subject matter shall be conducted unless otherwise indicated. The purpose of having two classes on each subject is to accommodate the attendance of as many OWNER personnel working different shifts as possible. The OWNER shall have the option, however, of requiring two (2) total classes, but each class shall contain different training material.

5. A maximum of one class per day shall be held on consecutive days unless otherwise approved by the OWNER. Multiple classes should be scheduled if the class duration is longer than four (4) hours. Times shall be scheduled at the discretion of the OWNER.

6. Each session shall be subdivided into two (2) to four (4)-hour modules, or as appropriate for the subject matter being discussed.

7. Training Sessions: Provide training sessions for equipment/system as specified in the individual equipment specification sections.

8. Length of Training: Each individual training session shall be planned to be completed within no more than four (4) hours, including two (2) fifteen (15)-minute break and a one (1) hour lunch period unless otherwise indicated. Requests for longer sessions must be specifically approved by the OWNER.

## 3.10 NOT USED

## 3.11 MEASUREMENT AND PAYMENT

A. No separate 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 01700
# CONTRACT CLOSEOUT

## PART 1 GENERAL

### 1.01 SCOPE OF WORK

A. This Section outlines the procedure to be followed in closing out the contract.

### 1.02 SUBSTANTIAL COMPLETION

A. The substantial completion date shall be established as stated in Section 00700 General Conditions and 00810 Supplemental General Conditions.

### 1.03 FINAL CLEANING

A. At the completion of work and immediately prior to final inspection, cleaning of the entire project shall be accomplished in accordance with 01710. Contractor shall complete final cleaning prior to submittal of the final application for payment. The cleaning shall leave the structures and site in a complete and finished condition to the satisfaction of the Engineer.

B. All Subcontractors shall similarly perform, at the same time, an equivalent thorough cleaning of all work and equipment provided under their contracts.

### 1.04 FINAL INSPECTION

A. After final cleaning and restoration and upon written notice from the Contractor that the work is completed, the Engineer will make a preliminary inspection with the Owner and the Contractor present. Upon completion of this preliminary inspection, the Engineer will notify the Contractor, in writing, of any particulars in which this inspection reveals that the work is defective or incomplete.

B. Upon receiving written notice from the Engineer, the Contractor shall immediately undertake the work required to remedy deficiencies and complete the work to the satisfaction of the Engineer.

C. When the Contractor has corrected or completed the items as listed in the Engineer's written notice, he shall inform the Engineer, in writing, that the required work has been completed. Upon receipt of this notice, the Engineer, in the presence of the Owner and the Contractor, will make his final inspection of the project.

D. Should the Engineer find all work satisfactory at the time of his inspection, the Contractor will be allowed to make application for final payment. Should the Engineer still find deficiencies in the work, the Engineer will inform the Contractor of the deficiencies and will deny the Contractor's request for final payment until such time as the Contractor has satisfactorily completed the required work.

1.05 FINAL SUBMITTALS

A. No application for final payment will be accepted until all submittals have been made and approved by the Engineer, including, but not limited to, the following:

1. Final shop drawings.

2. Project Record Documents.

3. All interface information.

4. All Operation and Maintenance Manuals.

5. All required indices and schedules.

6. All Manufacturers' Certificates of Proper Installation.

7. All State required submittals.

8. Certificate that all outstanding debts are paid and that there are no liens on the project.

1.06 ACCESSORY ITEMS

A. The Contractor shall provide to the Owner, upon acceptance of the equipment, all special accessories required to place each item of equipment in full operation. These special accessory items include, but are not limited to, the specified spare parts, adequate oil and grease as required for the first lubrication of the equipment, light bulbs, fuses, hydrant wrenches, valve wrenches, valve keys, handwheels, and other expendable items as required for initial start-up and operation of all equipment.

1.07 GUARANTEES, BONDS, AND AFFIDAVITS

A. No application for final payment will be accepted until all guarantees, bonds, certificates, licenses, and affidavits required for work or equipment as specified are satisfactorily filed with the Engineer.

1.08 RELEASE OF LIENS OR CLAIMS

A. No application for final payment will be accepted until satisfactory evidence of release of liens has been submitted to the Owner as required by the General Conditions.

1.09 FINAL PAYMENT

A. Final payment will be made to the Contractor in accordance with Section 00700 General Conditions and the Contract Documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

# SECTION 01710
# FINAL CLEANING

## PART 1 GENERAL

### 1.01 SCOPE OF WORK

A. Execute cleaning, during progress of the work, and at completion of the work, as required by General Conditions.

### 1.02 RELATED WORK

A. Standard General Conditions of the Contract are included in Section 00700.

B. Construction and Demolition Waste Management is included in Section 01505.

C. Contract Closeout is included in Section 01700.

D. Each Section: Cleaning for specific products or work.

### 1.03 DISPOSAL AND CLEANING

A. Conduct cleaning and waste disposal and management operations to comply with codes, ordinances, regulations and anti-pollution laws.

## PART 2 PRODUCTS

### 2.01 MATERIALS

A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.

B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

## PART 3 EXECUTION

### 3.01 DURING CONSTRUCTION

A. Execute periodic cleaning to keep the work, the site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.

B. Provide on-site containers for the collection of waste materials, debris and rubbish.

C. Remove waste materials, debris and rubbish from the site periodically in accordance with Section 01505 and, if applicable, dispose of at legal disposal areas away from the site.

3.02 DUST CONTROL

A. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.

B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

3.03 FINAL CLEANING

A. Employ skilled workmen for final cleaning.

B. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels and other foreign materials from sight-exposed interior and exterior surfaces.

C. Wash and shine glazing and mirrors.

D. Polish glossy surfaces to a clear shine.

E. Ventilating Systems:

1. Clean permanent filters and replace disposable filters if units were operated during construction.

2. Clean ducts, blowers and coils if units were operated without filters during construction.

F. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.

G. Prior to final completion, or Owner occupancy, conduct an inspection of sight-exposed interior and exterior surfaces and all work areas, to verify that the entire work is clean.

END OF SECTION

## PART I - GENERAL

### 1.01 SUMMARY

A. Furnish as described by this Section.

### 1.02 RELATED REQUIREMENTS

A. Work as called for on PLANS, or in this or any other CONTRACT Specification Sections (e.g. 01300 Submittals, 01700 Project Close-out, and other applicable specifications)

B. This section specifies the general minimum requirements for the contract. Other more specific requirements maybe described in various sections of the specifications. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

C. Description of Requirements

1. General

a. When required by individual Specification Sections or requested by OWNER, 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.

b. 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.

c. 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".

d. 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.

e. After all O&M Manuals are in acceptable form, CONTRACTOR to furnish to the ENGINEER eight (8) bound hard copies and (8) compact disk-read only memory (CD-ROM) copies, 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, and expandable binder with a maximum binding width

of 5”. Three-ring vinyl reinforced binders will not be acceptable. Each binder to have an index outlining all information in the set of volumes.

f. Retainage will not be released until the Operation and Maintenance Manuals have been submitted and approved by the ENGINEER.

2. Format

a. Provide each manual with a project cover sheet identifying – OWNER, facility name, facility address, manual volume number, number of volumes in the set, and date.

b. Divide manual/s into sections paralleling the Equipment Class and sequence as the technical specifications; include additional and/or other specific section/s where designated and/or required.

c. Within each manual, provide a Table of Contents for that manual. If more than one manual is necessary for a Class of Equipment, place a complete Table of Contents for that Class of Equipment within each manual of that Class.

d. Sections shall be separated with tabbed index sheets to correlate with the Table of Contents of the manual. The front of each section shall have a cover sheet indicating the equipment sections, provide a 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/s set.

e. 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.

f. All diagrams, drawings, and illustrations shall be of original quality, reproducible by the dry copy method.

g. 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.

h. Manual/Binder to be 8.5 X 11 inches. Drawings shall be 11 X 17 inches folded to 8.5 X 11 inches size for inclusion in 8.5 x11 inches manual. If 8.5 X 11 inches or 11 X 17 inches drawing is not practical, drawing/s may be folded accordingly and inserted into an envelope/tab provided in the appropriate section of the manual binder. Manual/s to be three post, hard cover, and heavy duty binders with information printed on the front cover of each binder as well as the binder backing. Paper shall be white 20-pound minimum. Each binder shall have an index outlining all information in the set of volumes. Binder size not to exceed four inches (4”) thickness; as required, utilize multiple volumes of binders, numbered accordingly.

D. Types of Information Required in O&M Data Packages

1. Each manual shall be specific to this CONTRACT. All non-applicable information shall be neatly crossed out, and the applicable information shall be color highlighted or otherwise indicated in a manner to prevent confusion of those utilizing the manuals. The O&M Manual/s shall contain complete information on all mechanical, electrical, instrumentation and control equipment and/or system/s furnished and installed including, but not limited to, the following:

a. Title Page/Cover Sheet

1) Identification of equipment covered by the manual by providing CONTRACT name, CIP NO., and equipment name and position tag number. These names and tag numbers will be provided to the CONTRACTOR by OWNER Representative.

2) Name of responsible principal, address, telephone number, and area of responsibility of:

   a) CONTRACTOR

   b) Subcontractor or installer

   c) Product manufacturer

   d) Nearest service center or maintenance CONTRACTOR, as appropriate

   e) Nearest supplier(s) of parts, materials, supplies, or replacement products.

   f) Neatly typewritten Title Page/Cover Sheet to include:

      I. Table of Contents

      II. Bill of Materials

      III. Equipment Data Sheets

      IV. System and Component Description

      V. Installation Instructions

      VI. Operation Procedures

      VII. Maintenance Schedule

      VIII. Maintenance Summary Form

      IX. Troubleshooting Guide

      X. Spare Parts, Part Identification, and Drawings

      XI. Technical Data

      XII. Warranties, Bonds, and Service Contracts

      XIII. Appendices

      XIV. Video of O&M training

b. Bill of Material

   1) Detailing the model, rating and size of each specific component used in the installation. Provide a list of equipment used in the installation. List shall detail the tag name used in the installation, model number, ratings, serial numbers of all pumps, motors, electrical apparatus and instrumentation, and enough information to purchase a replacement.

c. Equipment Data Sheets

1) An equipment data sheet shall be prepared for each piece of equipment or product covered by the manual.

2) Each data sheet shall list the actual equipment nameplate data, process name, and equipment position tag number of an individual product, date of installation, and all data given on the manufacturer's equipment nameplate for that product. When the product consists of separate component; e.g., pump, coupling, and motor; the data sheet shall have separate sections for each component. When a nameplate is not supplied by the manufacturer, design data for the product shall be given.

3) The appropriate model/size/item shall be highlighted on all equipment data sheets submittals.

d. System and Component Description

1) A brief description of the system that the product is a part of, to include all other applicable components of the system.

2) A brief description of the relationship between the system components and how they function as a unit.

3) Process flow diagram with system/equipment highlighted, as applicable.

e. Installation Instructions

1) Manufacturer's instructions for installation of the product, to include all applicable specifications, figures, and drawings.

f. Operation Procedures

1) Provide written instructions (with control diagrams and other applicable information).

2) Applicable start-up and break-in procedures as recommended by the manufacturer, including manual and automatic mod procedures.

3) Normal operational procedures.

4) System/equipment regulating and control procedures.

5) Normal shutdown procedures.

6) Seasonal operating instructions.

7) Emergency start-up and shut-down procedures.

8) Special operation instructions.

g. Maintenance Schedule

1) All maintenance tasks required or suggested by the manufacturer shall be listed in schedule form to include a description of the task, frequency at which the task is to be done, and other applicable information, such as

type of lubricant required, amount of lubricant required or specified test/measurement limits.

h. Maintenance Summary Form

1) 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:

I. Title: Arial - 16 point - bold.

II. Title: Arial - 16 point - bold.

III. Subheadings: Arial - 12 point - bold.

IV. Text: Arial - 12 point - regular.

V. Tables: As shown in Attachment A - minimum text size Arial - 10 point - regular.

d) Specific Instructions

I. Equipment Item: Include generic name for equipment along with service and specification reference.

II. 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.

III. 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.

IV. Total Weight: Note the assembled weight of the equipment.

V. Nameplate Data: Reproduce the nameplate data exactly as it appears on the equipment. For driven equipment, include the driver nameplate data.

VI. Manufacturer's Local Representative: Provide the name, address, and phone numbers of the local representative.

VII. Safety precautions. List personnel hazards and equipment or product safety precautions for all operating conditions.

VIII. 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.

IX. 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.

X. Maintenance Requirements

i. Maintenance Operation: List briefly each maintenance operation required to maintain warranty in effect and refer to specific information in manufacturer's standard maintenance manual.

ii. 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.

iii. Recommended calibration instructions and frequency. Instructions shall provide detailed description of the procedure to calibrate the unit.

iv. Complete disassembly, repair, and reassemble procedures in proper step sequence.

v. Manufacture specification for alignment, clearances, tolerances, and adjustments where applicable.

vi. 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.

vii. Applicable labeled section and exploded assembly drawings, and other drawings, figures and sketches as required for clarity of instructions.

viii. Refer by symbol to lubricant list.

XI. Lubricant List: List each recommended lubricant by symbol, noting generic type of lubricant, and a minimum of two manufacturers. The recommended lubrication products shall include a specific cross reference to an equivalent Exxon (Mobil) product.

XII. CONTRACTOR's Work Order: Identify CONTRACTOR's Work order number.

XIII. Closest Service Technician: Identify the closest, factory trained, and authorized, service technician by name, address and telephone number. Include pager number if applicable.

XIV. 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.

i. Troubleshooting Guides and Diagnostic Techniques

1) 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. Emergency shutdown and troubleshooting guide. Provide information to shut down and startup the equipment under emergency conditions.

j. Spare Parts, Part Identification, and Drawings

1) 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.

2) 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.<br>00000 | 2000002 |

k. Technical Data

1) Detailed description of the function of each principal component in the system. Provide a written description of the individual components function in the overall operation outlined above.

2) Test procedures and factory test results if required. Provide a copy of all factory tests performed and a copy of the test results, and performance curves, where applicable.

3) Manufacturer's Certified Pump Curves and field pump tests data and pump curves.

4) Documentation of field functional tests and performance test described in the specifications. Include the test results and calibration reports of all equipment.

l. Warranties, Warranty/Asset Management Tracking Form, Affidavits of Installation, and Service Contracts

m. Prime Contractor will remain single point of contact after final completion for all warranty work.

n. 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.

o. The CONTRACTOR shall complete and submit the Asset Management Tracking Form included at the end of this Section. Asset management tag numbers along with warranty information shall be tracked using the form provided and submitted with the required affidavits at the completion of the project. The excel file of the form included will be provided to the CONTRACTOR upon request. The electronic file as well as hard copies shall be provided to the OWNER as required by the Specifications.

p. This Asset Management Tracking Form list must be broken down in sufficient detail and approved by OWNER: Sheet to be provided any time that a warranty period is initiated per CONTRACT DOCUMENTS. Provide data for all tagged equipment and components.

q. The OWNER will provide asset tags for equipment and the CONTRACTOR will be responsible for affixing the tags on the equipment. The CONTRACTOR shall not affix asset management tags until OWNER has accepted the installation.

1) Supplemental Documentation

a) General

I. Manufacturer's original printed and maintenance instructions for couplings, belt drives, chain drives, or other means of equipment connection, to include applicable tolerances and specifications.

II. Manufacturer's original printed operation and maintenance instructions for appurtenances such as solenoid valves, or hydraulic cylinder operators that are a supplied or integral part of the system or product.

III. Calibration data sheet including set points. Include all calibration data sheets, as outlined in Calibration and Testing Section.

## 1.03 SUBMITTALS

A. No CD-ROM version of manuals shall be submitted prior to the approved final version of the manuals.

B. Only one (1) copy of the manual shall be written and submitted on a CD. Multiple copies of the manual submitted on one (1) CD will not be accepted.

C. Manuals shall be electronically transcribed matching the title, content, details, page number and sequence of the hard copy versions of the manuals.

D. Each CD or copy of the manual shall contain the latest version of Acrobat Reader software, which will allow the OWNER to access and read CD regardless of user's software. The CONTRACTOR can readily download software from the Internet.

E. CONTRACTOR shall also provide a CD video (DVD) of all O&M training sessions as part of the O&M submittals.

F. All drawings, cross-sectional view drawings, wiring diagram drawings, connection detail drawings, physical layout and detail drawings, elevations, etc., shall be developed electronically using AutoCAD® Release 14 software (or latest AutoCAD® Release).

G. All Bill of Material sheets and/or tables indicating product data, quantities, physical location and reference, catalog number, reference, wiring diagram drawing number reference, cost, and any other field entered in the bill of materials sheet and/or any other spreadsheets and/or any other table and/or listings of references, etc., shall all be electronically developed and submitted in a database format, using the latest version of Microsoft® Access software. This applies to all summary sheets, material listings, etc., to be submitted for this Project. Submittals shall include hard-copies and an electronic version developed in Microsoft® Access. Electronic version shall be submitted on CD-ROM and loaded to project FTP site.

H. AutoCAD® drawings shall be developed in full adherence to the formats and drawing standards defined in the AWU CADD Manual. A copy of the manual may be obtained from the City of Austin Water & Wastewater Utility. Any drawing that is developed or customized for this project by CONTRACTOR, Subcontractor, Supplier or Manufacturer shall be developed in or converted to AutoCAD format and shall be submitted in both electronic AutoCAD format and hard copy with the O&M Manual and loaded to project FTP site.

I. All Operation and Maintenance - 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 Adobe Acrobat® (*.pdf files) latest edition and 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 Adobe Acrobat® (*.pdf files) latest edition, and shall be submitted on CD-ROM and loaded to project FTP site. Electronic .pdf files of manuals, where feasible, shall be searchable by word within the .pdf files.

J. Binders and File Organization of the Electronic Copies: Clearly label each CD-ROM copy of the electronic version of the O&M Manuals. The CD-ROM 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 CD-ROM), 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 in the case (enclosure) of each CD-ROM and CD-ROM copies. All labels and tables of contents shall be neatly typed and labeled. Handwritten labels and/or tables of contents will not be accepted. Organize each set (a complete series) of O&M electronic copies in a CD-ROM hard-plastic case with locking and hinged cover. 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. This cover information should be repeated on the binder spine so that it is easy to read when all binders are stacked on a shelf.

K. It is the sole responsibility of the CONTRACTOR to ensure that all data submitted by the equipment supplier has been properly translated and incorporated onto the CD-ROM copies of the manuals. All hard and CD-ROM copies of the manuals shall match. All discrepancies and deviations between the hard and CD-ROM copies of the manuals shall be corrected at the cost of the CONTRACTOR, unless OWNER's Representative has provided written approval of the deviation.

**1.04 NOT USED**

**PART II - NOT USED**

**PART III - EXECUTION**

**3.01 GENERAL**

A. Submittal Schedule

1. Manuals shall be submitted according to the following schedule:

a. The preliminary copies of manuals shall be submitted following approval of the shop drawings, and no later than the on-site delivery for each piece of equipment.

b. The Final Operations & Maintenance Manuals will be the source documents for all manufacturer training, when specified, and subsequently for all check-out or start-up activities.

**3.02 MEASUREMENT AND PAYMENT**

No separate 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*** | 1. 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**

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# 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? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | |

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# SECTION 01740
# WARRANTIES AND BONDS

## PART 1 GENERAL

### 1.01 SCOPE OF WORK

A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.

### 1.02 RELATED WORK

A. Refer to Conditions of Contract for the general requirements relating to warranties and bonds.

B. General closeout requirements are included in Section 01700 Contract Closeout.

C. Specific requirements for warranties for the work and products and installations that are specified to be warranted are included in the individual Sections.

D. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

### 1.03 SUBMITTALS

A. Submit written warranties to the Owner prior to the date fixed by the Engineer for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the work, or a designated portion of the work, submit written warranties upon request of the Owner.

B. When a designated portion of the work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Owner within 15 days of completion of that designated portion of the Work.

C. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner for approval prior to final execution.

D. Refer to individual Sections for specific content requirements, and particular requirements for submittal of special warranties.

E. At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

F. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents and sized to receive 8-1/2-in by 11-in paper.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the Section in which specified and the name of the product or work item.

H. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address and telephone number of the installer, supplier and manufacturer.

I. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the project title or name and the name, address and telephone number of the Contractor and equipment supplier.

J. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.04 WARRANTY REQUIREMENT

A. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

B. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of the work through a portion of its anticipated useful service life.

D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the contract Documents.

F. The Owner reserves the right to refuse to accept work for the project where a special warranty, certification, or similar commitment is required on such work or part of the work, until evidence is presented that entities required to countersign such commitments are willing to do so.

G. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers and subcontractors required to countersign special warranties with the Contractor.

H. Separate Prime Contracts: Each Prime Contractor is responsible for warranties related to its own Contract.

1.05 MANUFACTURERS CERTIFICATIONS

A. Where required, the Contractor shall supply evidence, satisfactory to the Engineer, that the Contractor can obtain manufacturers' certifications as to the Contractor's installation of equipment.

1.06 DEFINITIONS

A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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# SECTION 01800
# FORMS

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Use the forms following this section for contract administration, making submittals, and documentation of test results. A single copy of these forms will be provided to the Contractor. Make additional copies of the forms as required. Contractor may substitute computer generated forms with the approval of the Engineer if these forms include the same information, statements and certifications and the same general format as the forms included in this section. Forms included are listed below:

1. Submittal Transmittal
2. Request for Information
3. Request for Deviation
4. Payment Request
5. Equipment Manufacturer's Certificate of Installation, Testing and Instruction
6. Professional Engineer Certification
7. Contractor's Certification of Final Payment
8. Contractor's Release of Owner
9. Pressure Pipe Test Report
10. Protective Coating Test Report
11. Contractor Acknowledgement
12. Two Week Schedule

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION (NOT USED)

END OF SECTION

# SUBMITTAL TRANSMITTAL

**DATE:** _____

**JOB:** City of Austin

South Austin Regional WWTP Thickener Improvements Project

**SUBMITTAL NO.:** _____

**CONTRACTOR'S SUBMITTAL NO.:** _____

**SPECIFICATION SECTION:** _____

**TO:** CDM Smith Inc.

12357-A RIATA TRACE PKWY., SUITE 210

AUSTIN, TX 78727

**ATTN:** _____

**WE ARE SENDING:**

HEREWITH ..... ❑

UNDER SEPARATE COVER ..... ❑

BY MESSENGER/COURIER ..... ❑

_____ PRINT(S) EACH OF THE FOLLOWING: _____

**WHICH ARE:**

FOR REVIEW & APPROVAL ..... ❑

_____ ..... ❑

PLEASE RETURN BY: _____

**SIGNATURE** **DATE**

**PRINTED NAME** **TITLE**

# REQUEST FOR INFORMATION

CITY OF AUSTIN
SOUTH AUSTIN REGIONAL WWTP THICKENER IMPROVEMENTS PROJECT

| | | | |
|---|---|---|---|
| **DATE:** | | **RFI NO.:** | |
| **TO:** | **CDM SMITH INC.**<br>12357-A RIATA TRACE PKWY. SUITE 210<br>AUSTIN, TX 78727 | **ATTN:** | |

❑ **ADDITIONAL COMMENTS ATTACHED**

**SIGNATURE** **DATE**

**PRINTED NAME** **TITLE**

## ENGINEER'S RESPONSE

❑ **RESPONSE ATTACHED**

**CDM SMITH USE ONLY**

❑LOGGED IN ❑RESP RECORDED ❑LOGGED OUT
DISTRIBUTED TO: _____
RESPONSE DUE BY: _____
RETURNED TO CONTRACTOR ON: _____

**SIGNATURE** **DATE**

**PRINTED NAME** **TITLE**

# REQUEST FOR DEVIATION

CITY OF AUSTIN
SOUTH AUSTIN REGIONAL WWTP THICKENER IMPROVEMENTS PROJECT

| | | | |
|---|---|---|---|
| **DATE:** | | **RFD NO.:** | |
| **TO:** | **CDM SMITH INC.**<br>12357-A RIATA TRACE PKWY. SUITE 210<br>AUSTIN, TX 78727 | **ATTN:** | |

❑ **ADDITIONAL COMMENTS ATTACHED**

**SIGNATURE** **DATE**

**PRINTED NAME** **TITLE**

## ENGINEER'S RESPONSE

❑ **RESPONSE ATTACHED**

**CDM SMITH USE ONLY**

❑LOGGED IN ❑RESPONDED
❑ RECORDED ❑LOGGED OUT
DISTRIBUTED TO: _____
RESPONSE DUE BY: _____
RETURNED TO CONTRACTOR ON: _____

**SIGNATURE** **DATE**

**PRINTED NAME** **TITLE**

# PAYMENT REQUEST

I _____certify that all items, units, quantities and prices of work and/or material shown on the face of sheets _____ of Periodical Estimate No. _____ are correct; that all work has been performed and materials supplied in full accordance with the terms of the Contract Documents and all authorized changes thereto; that the following is a true and correct statement of the contract account up to and including the last day of the period covered by this estimate; and that no part of the "Amount Due This Estimate" has been received.

_____
**CONTRACTOR COMPANY NAME**

_____
**CONTRACTOR ADDRESS**

_____
**CONTRACTOR PHONE NUMBER**

_____
**AUTHORIZED SIGNATURE**

_____
**PRINTED NAME**

_____
**TITLE**

_____
**DATE**

## RECOMMENDATIONS OF ENGINEER

This Periodical Estimate No. _____ has been reviewed and ❑ IS ❑ IS NOT recommended for payment.

DATE: _____ BY: _____
**CDM Smith**

## APPROVAL OF AUTHORIZED REPRESENTATIVES OF THE OWNER

This Periodical Estimate No. _____ has been reviewed and is approved for payment.

DATE: _____ BY: _____

DATE: _____ BY: _____

# EQUIPMENT MANUFACTURER'S CERTIFICATE OF INSTALLATION, TESTING & INSTRUCTION

**OWNER**: CITY OF AUSTIN

**PROJECT**: SOUTH AUSTIN REGIONAL WWTP THICKENER IMPROVEMENTS PROJECT

**EQUIPMENT SPECIFICATION SECTION**: _____

**EQUIPMENT DESCRIPTION**: _____

I, _____, authorized representative of
(PRINT NAME)

_____, hereby CERTIFY that
(PRINT MANUFACTURER'S NAME)

_____
(PRINT EQUIPMENT NAME AND MODEL, WITH SERIAL NO.)

installed for the subject project [has] [have] been installed in a satisfactory manner, [has] [have] been satisfactorily tested, [is] [are] ready for operation, and that Owner assigned operating personnel have been suitably instructed in the operation, lubrication, maintenance and care of the unit[s] on **DATE**: _____, **TIME**: _____.

**CERTIFIED BY**: _____ **DATE**: _____
(SIGNATURE OF MANUFACTURER'S REPRESENTATIVE)

## Owner's Acknowledgement of Manufacturer's Instruction

[I] [We] the undersigned, authorized representatives of the _____ and/or Plant Operating Personnel have received classroom and hands-on instruction on the operation, lubrication, and maintenance of the subject equipment and [am] [are] prepared to assume normal operational responsibility for the equipment:

**DATE**: _____

**DATE**: _____

**DATE**: _____

# PROFESSIONAL ENGINEER CERTIFICATION

The undersigned hereby certifies that he/she is a Professional Engineer registered in the State of_____ and that he/she has been employed by _____

_____
(NAME OF CONTRACTOR)

to design _____
(INSERT P.E. RESPONSIBILITIES)

_____

in accordance with Specification Section _____ for the _____

SOUTH AUSTIN REGIONAL WWTP THICKENER IMPROVEMENTS PROJECT.
(PROJECT)

The undersigned further certifies that he/she has performed the design of the _____

_____

and that said design is in conformance with all applicable local, State and Federal codes, rules and regulations, and that his/her signature and P.E. stamp have been affixed to all calculations and drawings used in, and resulting from, the design.

The undersigned hereby agrees to make all original design drawings and calculations available to the CITY OF AUSTIN
(OWNER)
or Owner's representative within seven (7) days following written request therefore by the Owner.

PROFESSIONAL ENGINEER'S PRINTED NAME | P.E. LICENSE NO.

SIGNATURE | DATE

ADDRESS

PHONE

**CONTRACTOR**

AUTHORIZED REPRESENTATIVE'S PRINTED NAME | TITLE

SIGNATURE | DATE

ADDRESS

PHONE

# CONTRACTOR'S CERTIFICATION OF FINAL PAYMENT

**OWNER**: CITY OF AUSTIN

**PROJECT**: SOUTH AUSTIN REGIONAL WWTP THICKENER IMPROVEMENTS PROJECT

**PROJECT NO.**: _____

**LOCATION**: _____

_____ agrees to accept the sum of $_____ as full and final payment for all work under its Contract dated _____ with the _____, for the construction of _____ _____. _____ certifies that all construction has been completed in substantial compliance with the Contract Documents, and that all labor, equipment, materials and Subcontractors have been or will be paid in accordance with the requirements of the Contract Documents, and the requirements of the General Laws of the _____

_____
**CONTRACTOR COMPANY NAME**

_____
**CONTRACTOR ADDRESS**

_____
**CONTRACTOR PHONE NUMBER**

_____
**AUTHORIZED SIGNATURE**

_____
**PRINTED NAME**

_____
**TITLE**

_____
**DATE**

# CONTRACTOR'S RELEASE OF OWNERS

The Contractor, known as _____, for the construction of SOUTH AUSTIN REGIONAL WWTP THICKENER IMPROVEMENTS PROJECT hereby and forever releases the Owner, known as the CITY OF AUSTIN its officers, agents and engineers, **CDM SMITH Inc.**, from all past, present and future claims and liability to the Contractor for anything done or furnished for, relating to, or for any act of neglect of the Owner, its engineers or any persons relating to or affecting the work.

## Contractor's Certification

_____
**CONTRACTOR COMPANY NAME**

_____
**CONTRACTOR ADDRESS**

_____
**CONTRACTOR PHONE NUMBER**

_____
**AUTHORIZED SIGNATURE**

_____
**PRINTED NAME**

_____
**TITLE**

_____
**DATE**

# PRESSURE PIPE TEST REPORT

**OWNER**: CITY OF AUSTIN

**PROJECT**: SOUTH AUSTIN REGIONAL WWTP THICKENER IMPROVEMENTS PROJECT

**CONTRACTOR:** _____

IDENTIFICATION:

SYSTEM FLUID: _____ IDENTIFICATION NO.: _____

PIPE SIZE: _____ PIPE MATERIAL: _____

LOCATION: _____

TEST FLUID: _____ TEST PRESSURE: _____ TEST TIME REQUIRED: _____

| TEST NO. | TEST TIME | INITIAL PRESSURE | FINAL PRESSURE | PRESSURE CHANGE | FLUID ADDED | TEST PASS/FAIL | TESTED BY | DATE |
|---|---|---|---|---|---|---|---|---|
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# PROTECTIVE COATING TEST REPORT

**OWNER**: CITY OF AUSTIN

**PROJECT**: SOUTH AUSTIN REGIONAL WWTP THICKENER IMPROVEMENTS PROJECT

**CONTRACTOR:** _____

---

REFERENCE DATA:

REFERENCE NO.: _____ DESCRIPTION: _____

APPLICATION AREA:

ITEM COATED (FROM DRAWINGS): _____

IDENTIFICATION NO.: _____ UNIT NO.: _____

LOCATION: _____

SURFACE PREPARATION:

- ❑ SHOP PRIMER
- ❑ FIELD BLAST - COMMERCIAL GRAY
- ❑ FIELD BLAST - NEAR WHITE
- ❑ BRUSH BLAST
- ❑ POWER TOOL & SOLVENT CLEANING
- ❑ FIELD BLAST - WHITE METAL

COATING APPLICATION:

| COAT TYPE | DESCRIPTION (BRAND, SERIES NAME/NO.) | COLOR | REQ'D | TEST | RETEST |
|---|---|---|---|---|---|
| PRIMER | | | | | |
| INTERIM | | | | | |
| INTERIM | | | | | |
| FINISH | | | | | |

CHECKED FOR HOLIDAYS:

❑ NOT REQUIRED ❑ TESTED AND DEFECTS MARKED – DATE: _____

❑ TESTED AND NO DEFECTS DISCOVERED – DATE: _____

TESTING BY: _____ WITH: _____

WITNESSED BY: _____ WITH: _____

# CONTRACTOR ACKNOWLEDGEMENT

CITY OF AUSTIN
SOUTH AUSTIN REGIONAL WWTP THICKENER IMPROVEMENTS PROJECT

**I CERTIFY THAT I HAVE RECEIVED THE FOLLOWING INFORMATION:**_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____
**CONTRACTOR COMPANY NAME**

_____
**CONTRACTOR ADDRESS**

_____
**CONTRACTOR PHONE NUMBER**

_____
**AUTHORIZED SIGNATURE**

_____
**PRINTED NAME**

_____
**TITLE**

_____
**DATE**

# TWO WEEK SCHEDULE

## CITY OF AUSTIN – SOUTH AUSTIN REGIONAL WWTP
## THICKENER IMPROVEMENTS PROJECT

**JOB NO.:** _____ **DATE:** _____ **20**_____

**AREA:** _____ **PAGE OF** _____ OF _____

| OPERATION | CREW/ SUB | MON | TUE | WED | THU | FRI | SAT | SUN | MON | TUE | WED | THU | FRI | SAT | SUN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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## 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.

**END**

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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 Danny M. Hurtado, 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 CDM Smith 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 the SAR WWTP Thickener Improvements Project, located at the South Austin Regional Wastewater Treatment Plant, 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: [signature]

STATE OF TEXAS
COUNTY OF TRAVIS

ON DECEMBER, 14TH, 2015, personally appeared DANNY M. HURTADO 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
JAMIE M GOMEZ
My Commission Expires
June 17, 2018

Notary Public, State of Texas [signature]

Printed Name of Notary JAMIE GOMEZ

My Commission Expires: JUNE 17, 2018

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CITY OF AUSTIN

# STATEMENT OF NON-INCLUSION OF ASBESTOS CONTAINING MATERIAL

**ENGINEER/ARCHITECT AFTER DESIGN**

STATE OF TEXAS
COUNTY OF TRAVIS

"My name is Danny M. Hurtado, 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 CDM Smith 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 the SAR WWTP Thickener Improvements Project, located at the South Austin Regional Wastewater Treatment Plant 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.

   _____

   _____

   _____

   _____

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 MARCH 10TH, 2016, personally appeared DANIEL HURTADO 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
JAMIE M GOMEZ
My Commission Expires
June 17, 2018

Notary Public, State of Texas _____

Printed Name of Notary JAMIE GOMEZ

My Commission Expires: JUNE 17, 2018

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## PART 1 – LEAD ABATEMENT

Refer to Section 01040 for lead abatement instructions.

## PART 2 – ASBESTOS ABATEMENT

The Asbestos Abatement Specifications for the OWNER's Abatement Contractor project are attached. Refer to Section 01040 for coordination with the OWNER's Abatement Contractor for asbestos abatement.

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# Asbestos Abatement Specifications

## SOUTH AUSTIN REGIONAL (SAR) WASTEWATER TREATMENT PLANT THICKENER IMPROVEMENTS PROJECT 1017 FALLWELL LANE DEL VALLE, TEXAS

COA REQUEST NO. 15272 & 16006L
Terracon Project No. 96157512

**Prepared for:**
City of Austin
Austin, Texas

**Prepared by:**
Terracon Consultants, Inc.
TDSHS Asbestos Consultant Agency License No. 100157
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TDSHS Individual Asbestos Consultant
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Attachment:

Site Drawing

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**SCOPE OF WORK –**
**ASBESTOS ABATEMENT SPECIFICATIONS**

South Austin Regional (SAR) Wastewater Treatment Plant
Thickener Improvements Project
1017 Fallwell Lane, Del Valle, Texas
CoA Request No. 15272 & 16006L
Terracon Project No. 96157512

The work will consist of asbestos abatement to be conducted in the interior and exterior portions of the one-story Sludge Transfer Building to facilitate work which may be necessary to produce penetrations for various pipes, HVAC duct and/or conduit through brick/block wall elevations which include asbestos-containing vermiculite insulation materials in the Sludge Transfer Building at the SAR Wastewater Treatment Plant. Abatement may be conducted in several phases as scheduled by the **Owner**.

## I. Materials, Quantities, and Locations

The work will consist of the removal of the following materials at the site in the approximate quantities listed. All work will be conducted by properly licensed personnel in accordance with applicable Federal, State and Municipal regulations. ***(The quantities listed below are estimates only. The Contractor is responsible for verifying locations and quantities prior to submission of the price quote to the Owner. The Contractor will perform work for the materials indicated, regardless of actual quantities.)***

- Concrete Masonry Unit (CMU) Flowing Fill (Vermiculite) - The grey flowing fill materials which were installed in the perimeter wall CMU cavities of the Sludge Transfer Building were found to contain Vermiculite which includes the Libby, Montana amphibole (2% Amosite by PLM) and are considered an asbestos-containing material. The asbestos-containing vermiculite installed in the CMU perimeter wall cavities was noted to be in fair condition and was assessed as being friable. The material is installed in all areas within the perimeter wall construction of the Sludge Transfer Building but did not appear to be present in the interior Electrical Room build-out or the eastern Vault wall. Removal will consist of the work to produce two (2) approximately 6 to 8 square foot sleeved rectangular openings for HVAC duct in the north wall of the Electrical Room, and at least two (2) approximately 10" diameter sleeved round holes in the south end of the east wall of the building as well as any other pipe/electrical penetrations which are required to facilitate the planned improvements to the Sludge Transfer Building. It is estimated that approximately 0.25 cubic yards of flowing vermiculite fill is located within the perimeter wall cavity cells where the penetrations will be produced.



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## II. Work Practices

A. Respiratory Protection:

During the gross removal phases of the asbestos-containing materials, the workers will be required to wear as a minimum, Powered Air-Purifying Respirators (PAPR's), equipped with filter cartridges designed for asbestos-containing dusts, mists and vapors, and color coded in accordance with ANSI Z2282 (1980). Certification that the workers have been fit tested for each type of respirator in accordance with current OSHA guidelines will be provided as part of Worker Documentation. **The Contractor shall insure use of the appropriate respiratory protection for the work being performed and recognizes that the respiratory requirements stated herein are only minimum acceptable standards.** The **Contractor** will furnish respirator filter cartridges as required by the **Asbestos Consultant**.

B. Protective Clothing

During removal of the asbestos-containing materials within full containment work areas, single protective suits, as a **minimum,** will be worn by the workers and hardhats, boots, gloves and eye protection will be available to each worker as needed. Each protective suit will be properly disposed of as asbestos-containing material (**ACM**) at the conclusion of each work period. The workers performing the abatement activities will decontaminate through a three-chambered wet decontamination unit which will be constructed as an integral part of the containment. The **Contractor** will furnish protective suits as required by the **Asbestos Consultant**.

During removal of any materials which require exterior asbestos-related work within a regulated area, double protective suits will be worn by the workers and hardhats, boots, gloves and eye protection will be available to each worker as needed. When leaving the regulated work area, the workers will remove the outer suit within the regulated work area and will proceed directly to a remote decontamination unit. Each protective suit will be properly disposed of as asbestos-containing material (**ACM**) at the conclusion of each work period. The remote single-chamber wet decontamination unit, as a **minimum,** will be constructed in a central location readily accessible by workers who will proceed to the decontamination unit after removing the outer suit within the regulated work area.

C. Containment

The interior asbestos-containing materials are intended to be removed using wet removal techniques under negative pressure within a contained area which has an integral three-chamber wet decontamination unit. The full containment will consist of a double layer of 4-mil poly covering all walls not scheduled for removal and a double layer of 6-mil poly covering all floor areas within the contained area. Critical barriers consisting of 6-mil poly will be installed in addition to the above on all building openings or above the Electrical Room.



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Inverted prep will be required and the **Contractor** shall maintain negative pressure (minimum of –0.020 in/$H^2O$) in all work areas throughout abatement activities. A functioning manometer will be required to show proof of appropriate pressure. Any remaining equipment and/or contents will be removed from the work area prior to commencement of work. Immovable equipment or contents will be covered/wrapped in two layers of 6-mil polyethylene prior to the commencement of work.

The **Contractor** will construct a three-chambered wet decontamination system consisting of a serial arrangement of connected rooms or spaces (Changing Room, Shower Room, and Equipment Room), with overlapping door flaps, constructed as an integral part of any containment. The Decontamination System shower chamber will consist of a hard enclosure with drain and water supply fittings designed for the purpose rather than a disposable/pop up chamber. Disposable/pop up chamber units are acceptable for the clean and dirty room portions of the decontamination system. The **Contractor** shall require all persons without exception to pass through this decontamination unit for entry into and exiting from the work area for any purpose. Do not allow parallel routes for entry or exit.

Changing Room (clean room): Provide a room that is physically and visually separated from the rest of the building for the purpose of changing into protective clothing. Construct using polyethylene sheeting, at least 6 mil in thickness, to provide an airtight seal between the Changing Room and the rest of the building. Locate so that access to Work Area from Changing Room is through Shower Room. Separate Changing Room from the building by a polyethylene overlapping flapped doorway.

Maintain the floor of the changing room in a dry and clean condition at all times. Do not allow overflow water from shower to wet the floor in the changing room. Damp wipe all surfaces twice after each shift change with a disinfectant solution.

Provide a continuously adequate supply of disposable bath towels.

Provide all mandated warning signage, and posted information for all emergency phone numbers and procedures.

Shower Room: Provide a completely water tight, design built operational shower to be used for transit by appropriately dressed workers heading into the Work Area from the Changing Room, or for showering by workers headed out of the Work Area after undressing in the Equipment Room.

Construct room by providing a shower pan and 2 shower walls in a configuration that will cause water running down walls to drip into pan. Install a freely draining floor in the shower pan at an elevation that is at the top of pan.

Separate this room from the Changing and Equipment Rooms with moveable overlapping

flaps fabricated of 6 mil polyethylene.

Provide splash-proof entrances to Changing and Equipment Rooms with 2 doors arranged in the following configuration:

At each entrance to the Shower Room construct a doorframe out of lumber, PVC Pipe or equivalent. Attach to this door frame two overlapping flaps fastened at the head (top) and jambs (sides). Overlap the flaps that present a shingle-like configuration to the water stream from the shower. Arrange so that any air movement out of the Work Area will cause the flaps to seal against the door frame.

Provide shower head and controls. Provide temporary extensions of existing hot and cold water and drainage, as necessary for a complete and operable shower.

Provide a continuously adequate supply of soap and maintain the area in a sanitary condition. Arrange so that water from showering does not splash into the Changing or Equipment Rooms.

Provide flexible hose showerhead. Pump wastewater to a sanitary sewer drain or to storage for use in amended water. If pumped to a sanitary sewer drain, provide 20 micron and 5 micron waste water filters in line to drain or waste water storage. Change filters daily or more often if necessary. Provide Hose Bib.

Equipment Room (contaminated area): Require work equipment, footwear and additional contaminated work clothing to be left here. This is a change and transit area for workers. Separate this room from the work area by a 6 mil polyethylene overlapping flap doorway. Separate this room from the rest of the building with airtight walls fabricated of 6 mil polyethylene. Separate this room from the Shower Room and Work Area with airtight walls fabricated of 6 mil overlapping flapped polyethylene.

Work Area: Separate work area from the Equipment Room by polyethylene barriers. If the airborne asbestos level in the work area is expected to be high, add an intermediate cleaning space between the Equipment room and the Work area. Damp wipe clean all surfaces after each shift change. Provide one additional floor layer of 6 mil polyethylene per shift change and remove contaminated layer after each shift.

**Waste Load Out Area:** where applicable, the **Contractor** will construct a waste load out chamber separately from the three chambered personnel decontamination unit. The waste load out chamber will be connected to the work area, and ingress and egress will be through an overlapping flapped doorway constructed of six millimeter polyethylene sheeting. The exit of the waste load out area will also be constructed with six millimeter polyethylene overlapping flapped doorway. The water generated during the waste load out procedures as a result of cleaning the outside of the bags will be properly filtered and/or containerized prior



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to discharge into the sanitary sewer.

In **Exterior Locations** where asbestos-containing materials are to be removed, the work area will be conducted in mini-containment or glove-bag enclosure within an appropriately Regulated Work Area demarcated with appropriate barrier tape and the Contractor shall display all appropriate OSHA and TDSHS signage. The Workers shall be in proper protective equipment and decontaminate through a single-chamber decontamination wet decontamination unit erected in a central location accessible to the workers. Critical barriers/additional glove-bag enclosures shall be placed on the interior side of all locations where openings are to be produced. The materials will be removed using wet manual removal techniques within a mini-containment or glove-bag enclosure. If the glove-bag method is used (interior or exterior) the work shall be conducted in a regulated area with a single layer of 6-mil polyethylene affixed to the wall below each opening and placed on the ground at least five (5) feet out from the wall. The workers and all tools, waste bags, etc. resulting from removal operations shall remain on the polyethylene drop cloth (whether on the ground or elevated on lifts) throughout the work period.

D. Removal

The **Contractor** will perform the removal and disposal in accordance with current Local, State and Federal regulations.

1. **Asbestos-Containing Vermiculite Wall Fill Materials:** Comply with wet removal procedures during any removal activities. **Removal of the vermiculite in other locations (Penetrations, door openings, etc.)** shall be accomplished under negative pressure within a mini-containment with an integral wet decontamination unit on at least one side of the work. The mini-containment will consist of a single pop-up receptacle or site erected temporary structure with a single layer of 6-mil poly covering all walls and the ceiling on each side of the penetration and two layers of 6-mil polyethylene on all floor areas. Negative pressure (minimum of –0.020 in/H2O) will be maintained in all work areas. A functioning manometer will be required to show proof of appropriate pressure. The flowing wall fill materials shall be removed in their entirety and disposed of as ACM. The interior cavities of the CMU block will be thoroughly cleaned and encapsulated to facilitate installation of any sleeve(s). The rough dimensions of each penetration shall be provided to the **Abatement Contractor** and the location of each penetration/small wall opening shall be laid out by others prior to the commencement of work. The **Abatement Contractor** shall remove complete blocks at the mortar joints or produce holes with an appropriate hole saw after all fill materials have been removed and install and seal (with clear caulk) any sleeves which are provided in a workmanlike manner.

**The flowing fill materials will be addressed as follows:** Construct temporary enclosure on one side of the wall and install a glove-bag on the other. Pierce the wall cavities where penetrations are to be installed in the CMU construction with hammers and immediately wet

all fill materials which flow from the wall cavity area with amended water or removal encapsulant. During the removal of the flowing wall fill materials, the materials will be immediately containerized with as little disturbance as possible and continual wetting of the material will occur. Following removal of the flowing fill materials, the finished dimensions of the penetration shall be produced and the cavity area of the opening above and below the penetrations shall be HEPA vacuumed and encapsulated. The provided sleeve structure shall be installed and sealed with a provided clear caulk at each side of the wall. Any debris which accumulates on the drop cloths shall be kept wet and placed into disposal bags as soon as practical. All resulting waste will be disposed of in accordance with the guidelines discussed in Item E of the specification. Once the sleeves are installed/sealed at each penetration location, the min-containment will undergo TEM final clearance testing prior to removal of the temporary enclosures. Waste resulting from removal of temporary enclosures shall be double bagged and disposed of as ACM following receipt of acceptable final clearance testing results.

All work areas (containments and mini-containments) will be cleared by aggressive TEM clearance methodologies as described in Section F of this document.

E. Disposal

1. Once the ACM is removed, it will be double bagged and labeled in accordance with Texas Department of State Health Services (TDSHS) and OSHA guidelines. Pre-printed Generator Labels shall be affixed to each bag or wrapped component prior to being placed in the lined waste disposal dumpster or trailer.

2. All waste will be labeled in accordance with 29 CFR 1910.1200 (f) of OSHA's Hazard Communication standard, and will contain the following information:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

3. The area between the bag-out area and the prepared waste receptacle shall be regulated with barrier tape during bag-out operations. The waste dumpster or trailer shall remain secured during all other periods.

4. The waste will be disposed in an approved landfill. The waste will be transported to the landfill in a poly-lined closed top receptacle. Verification of disposal at the landfill will be provided to the **Owner** by the **Contractor** via the Waste Manifest.

F. Clearance

Aggressive Transmission Electron Microscopy (TEM) clearance sampling will be conducted in accordance with the AHERA Method (40 CFR Part 763, Subpart E, Appendix A), in all work areas in which abatement has occurred. Minimum sample volume will be 1,500 liters per sample. Clearance will be achieved if no sample is reported greater than 70 asbestos structures per square millimeter (s/mm$^2$) by the analysis report from the licensed laboratory.

## III. Contractor Submittals

Submittals required for proper execution include but are not limited to the following:

Pre-Construction Submittals (submitted to **Asbestos Consultant**)

Regulatory Notification Information
Plan of Action
Fire Action Plan
Emergency Phone List
Project Schedule
Copy of Written Respirator Program which conforms to 29 CFR 1910.134(b)
OSHA Material Safety and Data Sheets (Product Handling)
Verification of Workers' Compensation Insurance Coverage

Construction Submittals (**submitted to Asbestos Consultant before start of work on-site**)

Licenses: Contractor, Transporter(s), Supervisor, Workers
NESHAP Training Certificate (if required)
List of Workers
Medical Examination Results
Training Certificates (Supervisor, Worker and RFCI)
Respiratory Fit Test Certificates
Certificates of Worker Acknowledgement
Previous Personal Air Monitoring Analysis Results

Project Closeout (**submitted to Asbestos Consultant no later than ten (10) working days following completion of the project**)

Contractor's Daily Log(s)
Waste Disposal Manifest Copies
Certificate of Completion (if required)
Releases, Occupancy Permits (if applicable)
Personal Air Monitoring Analysis Results (if applicable)

RESUBMISSION:

Revise submittals as required and resubmit as specified for initial submittal. Indicate any changes which have been made other than those requested by **Asbestos Consultant**.

**CONTRACTOR** RESPONSIBILITIES:

Illegible submittals will be rejected and returned for re-submittal.

Schedule submittals according to general flow of Work so as to allow for adequate and timely review of submittals by **Asbestos Consultant**.

Review submittals prior to submission and submit to **Asbestos Consultant** in accordance with provisions herein.

Verify field measurements, construction criteria, catalog numbers and similar data.

Coordinate submittals with requirements of Work and Contract Documents.

**Contractor's** responsibility for errors or omissions is not relieved by **Asbestos Consultant's** review.

**Contractor's** responsibility for deviations from requirements of Contract Documents is not relieved by **Asbestos Consultant's** review, unless **Asbestos Consultant** is notified of deviations in writing at time of submittal, and gives written review of specific deviations.

Do not begin work which requires submittals until reviewed submittals have been reviewed and approved by **Asbestos Consultant**.

If required, reproduce and distribute copies after **Asbestos Consultant's** review.

**ASBESTOS CONSULTANT'S** RESPONSIBILITIES:

Review submittals within two working days or indicate in writing reasons for reviews which require additional time.

Review for conformance with design concept of project and information given in Contract Documents.

Indicate results of review and return submittals to **Contractor** for distribution.

**Asbestos Consultant** is not responsible for verification of field measurements, construction criteria, catalog numbers and other similar data.

Review of separate items does not constitute review of an assembly in which items function.

## IV. Construction Notes

The **Contractor** shall be responsible for submission of the TDSHS 10-day Asbestos/Demolition Notification Form. The **Owner** shall be responsible for payment of notification fees associated with the TDSHS 10-day Asbestos/Demolition Notification Form.

The **Contractor** will remove all movable items from the work areas prior to commencement of abatement activities and stage the materials in an orderly fashion for return to the **Owner** or disposal by others.

The successful **Contractor** will coordinate security concerns, procedures, background checks, badges, etc. with the **Owner**.

During the pre-cleaning phase of abatement operations, all exposed non-movable equipment will be wet wiped, HEPA vacuumed and covered with two layers of six-mil polyethylene.

The **Contractor** will be responsible for routing water and electricity to the work areas. Water and electrical service are reportedly present on the site at this time. The structure is scheduled for renovation and the **Contractor** shall confirm the presence and location of utilities prior to the start of work and coordinate the routing of the utilities with the **Owner**. If required, the **Contractor** will supply a suitable electrical generator and potable water tank for use during abatement activities. The **Contractor** shall provide routing of water and electrical service for the on-site requirements of the **Asbestos Consultant**.

The **Contractor** is to be current and in good standing on all asbestos abatement notification fees. The **Owner** reserves the right to verify **Contractor's** standing.

The **Contractor** shall maintain all records required by TDSHS Texas Asbestos Health Protection Rules Section 295.62 Operations: Recordkeeping

**Contractor** parking and disposal dumpster areas will be as designated by the **Owner**. The **Contractor** will keep work and parking areas clean.

Prior to any asbestos abatement activities, the Contractor shall coordinate with Austin Water Utility to complete any necessary power lock-out and tag-out of all circuits to be affected by the asbestos abatement activities. Lock-out/Tag-out will meet OSHA 1910.147 requirements.



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All electrical circuits within the regulated and/or contained work area shall have ground-fault circuit interrupter (GFCI) units installed **outside** the contained work area. GFCI protection at the receptacles shall be achieved with a GFCI protected Cord attachment to existing outlets used for asbestos abatement activities.

Exhaust negative pressure ventilation system to outside of building. Plywood inserts or a similar hard barrier may be required at the **Owner's** discretion for building security on any building openings utilized for exhaust purposes.

The **Contractor** shall arrange the use of on-site toilet facilities with the **Owner** or provide temporary self-contained toilet units for use by **Contractor's** personnel throughout the duration of abatement activities.

The **Contractor** shall install one functioning fire extinguisher in the work area for each 1,000 square feet of work area or part thereof. Additional functioning fire extinguishers shall be installed in the Equipment (Dirty) Room and Clean Room of the decontamination unit.

The **Contractor** shall conduct a safety meeting for **Contractor's** employees with emphasis on operation of fire extinguishers and emergency exits in case of fire.

The **Contractor** shall have posted emergency phone numbers for the fire department, ambulance and police department.

**Contractor** shall store a minimum of volatile substances on the job site and in fire resistant containers only.

## V. Products

**Products containing Methyl Chloride or a sister product shall not be utilized on the project.**

Amended Water: Provide water to which a surfactant has been added. Use a mixture of surfactant and water which results in wetting of the ACM and retardation of fiber release during disturbance of the material being removed. The **Contractor** may**,** at the **Contractor's** discretion, utilize water to which a mild detergent has been added, in lieu of a commercially available amended water product.

Chemical Paint Remover: Caustic paint stripper products which contain Methyl Chloride or a sister component and/or with a flash point of 140 degrees Fahrenheit or below will not be utilized on the project.

Disposal Bags: Provide as a minimum, individual, 6 mil thick, leak-tight, manufactured polyethylene bags.

Disposal Bag Labels: Provide labels with **Owner's** name, **Contractor's** name, Project site address and the following warnings and labels, in accordance with regulatory requirements. Labels shall be lettered with indelible ink.

First Label:

CAUTION
CONTAINS ASBESTOS FIBERS
AVOID OPENING OR BREAKING CONTAINER
BREATHING ASBESTOS IS HAZARDOUS TO YOUR HEALTH

Second Label: Provide in accordance with 29 CFR 1910.1200(f) of OSHA's Hazard Communication standard:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
BREATHING AIRBORNE ASBESTOS, TREMOLITE, ANTHOPHYLLITE, OR
ACTINOLITE FIBERS IS HAZARDOUS TO YOUR HEALTH

Third Label: Provide in accordance with U.S. Department of Transportation Regulation on hazardous waste marking. 49 CFR parts 171 and 172. Hazardous Substances: Final Rule:

RQ HAZARDOUS
SUBSTANCE,
CLASS 9,
NA 2212, PG III
(ASBESTOS)

Mastic Remover/Solvent: Solvents with a flash point of 140 degrees Fahrenheit or below will not be used.

Polyethylene Wrap: Provide minimum 6 mil polyethylene sheeting as a wrapping for large sections of rigid waste material and for construction of floors and critical barriers in the containment areas. Provide minimum 4 mil polyethylene sheeting for construction of walls of the containment.

Removal Encapsulant: Provide a penetrating type encapsulant designed specifically for removal of **ACM**. Utilize an encapsulant that will meet or exceed the results produced by use of Amended Water, as described above.



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Sprayer: Provide a hand pump type pressure-can garden sprayer fabricated out of either metal or plastic, equipped with a metal wand at the end of a hose that can deliver a stream or spray of liquid under pressure.

## VI. Air Monitoring Services

The **Asbestos Consultant** shall verify that the Work performed is in compliance with applicable regulations and that the building areas beyond the Work Area and the outside environment remain free of contamination. This section also sets forth airborne fiber levels both inside and outside the Work Area as action levels, and describes the action required by the **Contractor** if an action level is met or exceeded.

AIR MONITORING:

The **Asbestos Consultant** will be conducting air monitoring throughout the course of the project.

Base Line Fiber Counts: The **Asbestos Consultant** will monitor airborne fiber counts prior to start of Work. The purpose of this air monitoring will be to establish existing airborne fiber counts prior to beginning abatement operations.

Work Area Isolation: The **Asbestos Consultant** will monitor airborne fiber counts outside the Work Area. The purpose of this air monitoring will be to detect faults in the Work Area isolation including, but not limited to, contamination of the building outside of the Work Area with airborne asbestos fibers, failure of filtration or rupture in the ventilation system, or contamination of the exterior of the building with airborne asbestos fibers.

Should any of the above occur, the **Contractor** shall immediately cease asbestos abatement activities until the fault is corrected. Work shall not recommence until authorized by the **Asbestos Consultant**.

Work Area Airborne Fiber Count: The **Asbestos Consultant** will monitor airborne fiber counts in the Work Area. The purpose of this air monitoring will be to detect airborne fiber counts which may significantly challenge the integrity of Work Area isolation procedures that protect the balance of the building or outside of the building from contamination by airborne fibers.

Final Clearance: The **Asbestos Consultant** will conduct Final Clearance air sampling in accordance with the Final Clearance Section of this Specification. Aggressive TEM clearance sampling will be conducted in any contained area in which abatement has occurred. Minimum sample volume will be 1,500 liters per sample. Clearance will be achieved if no sample is reported greater than 70 s/mm$^2$ by the analysis report from the licensed laboratory.

AIRBORNE FIBER COUNTS:

Inside Work Area: Maintain an average airborne count in the Work Area of less than 0.2 fibers per cubic centimeter. If the fiber counts rise above this figure for any sample taken, revise work procedures to lower fiber counts. If the Time Weighted Average (TWA) fiber count for any Work shift or eight (8) hour period exceeds 0.2 fibers per cubic centimeter, stop Work and leave ventilation system in operation. Do not recommence Work until authorized by the **Asbestos Consultant**.

Outside Work Area: Maintain an average airborne count outside the Work Area of less than or equal to Base Line.

If any air sample taken outside the Work Area exceeds the Base Line, immediately and automatically stop Work until the source of the high fiber readings can be determined by the **Asbestos Consultant**. If no outside non-asbestos source can be located by the **Asbestos Consultant** and if this air sample was taken inside the building and outside of Critical Barriers around the Work Area, immediately erect new Critical Barriers to isolate the affected area from the balance of the building or as instructed by the **Asbestos Consultant.**

Erect Critical Barriers at the next existing structural isolation of the involved space (e.g. wall, ceiling, floor).

Decontaminate the affected area in accordance industry standard methods.

Respiratory protection as set forth in the Work Practices Section shall be worn in affected area until area is cleared for reoccupancy.

Leave Critical Barriers in place until completion of Work and insure that the operation of the negative pressure ventilation system in the Work Area results in a flow of air from the balance of the building into the affected area.

If the exit from the clean room of the personnel decontamination unit enters the affected area, establish a new decontamination facility.

After visual inspection in the extended work area, remove Critical Barriers separating the work area from the affected area. Final Clearance air samples will be taken within the entire area.

Fiber Type Disputes: The following procedure will be used to resolve any disputes regarding fiber types when the Project has been stopped due to excessive airborne fiber counts:

Air samples will be secured in the same area by the **Asbestos Consultant** for analysis by Transmission Electron Microscopy at the option of the **Asbestos Consultant** and classified

as retests and backcharged to the **Contractor** in accordance with the procedures in this specification.

ANALYTICAL METHODS:

The following methods will be utilized at the discretion of the **Asbestos Consultant** in collecting and analyzing air samples:

Phase Contrast Microscopy (NIOSH 7400 Method, Issue 2, Revision 3 or OSHA Reference Method)

Transmission Electron Microscopy (40 CFR Part 763, Subpart E, Appendix A)

SAMPLE PROTOCOLS:

General: The number and volume of air samples taken by the **Asbestos Consultant** will generally be in accordance with the following schedule. Sample quantities, locations, volumes and methodologies may vary depending upon the analytical method, project layout, procedures used and at the discretion of the **Asbestos Consultant**.

SCHEDULE OF AIR SAMPLES:

Base Line Sample Schedule: The **Asbestos Consultant** will secure the following air samples to establish a Base Line before start of Work. The number of samples may vary according to site plan and on authorization of **Asbestos Consultant**.

| Location Sampled | Minimum Number of Samples | Minimum Volume | Planned Analytical Method |
|---|---|---|---|
| Each Work Area | 3 | 1,250 Liters | PCM |
| Outside Each Work Area | 1 | 1,250 Liters | PCM |
| Outside Building | 1 | 1,250 Liters | PCM |

Base Line Fiber Level: is an action level expressed in fibers per cubic centimeter which is the larger of either the average of the samples collected or 0.01 fibers per cubic centimeter of air. The Base Line samples may be collected but archived (not read) at the discretion of the **Asbestos Consultant.**



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Daily Sample Schedule (per 8-hour work period): The **Asbestos Consultant** will generally take the following samples on a daily (8-hour work period) basis. The number of samples may vary according to site plan and on authorization of **Asbestos Consultant**.

| Location Sampled | Minimum Number of Samples | Minimum Volume | Planned Analytical Method |
|---|---|---|---|
| Each Work Area | 2 | 500 | PCM |
| Outside Each Work Area/Inside Building | 2 | 500 | PCM |
| Decon Clean Room | 2 | 500 | PCM |
| Output of Negative Pressure Ventilation System | 2 | 500 | PCM |

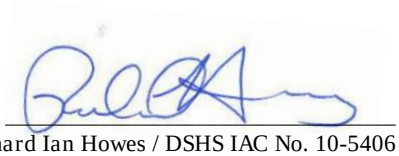
If airborne fiber counts exceed baseline limits, additional samples will be taken (and classified as retests) as necessary to monitor fiber levels and confirm sources.

Final Clearance Schedule (per containment): The **Asbestos Consultant** will collect the following samples after completing a visual inspection of the work area. The number of samples may vary according to site plan and on authorization of **Asbestos Consultant**.

| Location Sampled | Minimum Number of Samples | Minimum Volume | Planned Analytical Method |
|---|---|---|---|
| Each Work Area | 5 w/ 3 Blanks | 1,500 Liters | TEM |

Release Criteria: Gross decontamination is complete when every Work Area sample is below 70 structures per square millimeter (<70 s/mm$^2$). If any sample is above the limit indicated, then the gross decontamination is incomplete and recleaning by decontamination





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procedures and/or ventilation system cycling is required and primary containment barriers cannot be removed.

INSPECTIONS:

The **Asbestos Consultant**, in addition to providing air monitoring services, will provide full-time, on-site inspection of Work activities. Work shall not proceed without prior notice to the **Asbestos Consultant** and presence of the **Asbestos Consultant** on the Work site (requires 48 hours advance notice of Work).

The **Asbestos Consultant** will conduct the following key Project inspections and no work by the **Contractor** will proceed beyond these points until all discrepancies noted during the inspection have been corrected.

The **Asbestos Consultant's** inspections do not relieve the **Contractor** of Contract obligations and are not designed to locate all project discrepancies. The **Contractor** is responsible for project quality.

First Key Inspection:

Inspection of Work Area and Containments Prior to Start of Removal: Removal operations shall not proceed until the **Asbestos Consultant** has completed inspection of the Work Area preparations and until all discrepancies noted have been corrected.

Second Key Inspection:

Inspection During Removal: Removal Work shall not be conducted unless the **Asbestos Consultant** is on the Project site. Daily inspection of the Work Area and Work practices will be conducted; upon discovery and report of a discrepancy the **Contractor** shall immediately stop Work and correct the discrepancy.

Third Key Inspection:

Inspection of Work Area or Containment After Completion of Removal Work, but Prior to Encapsulation and Containment Disassembly: A visual inspection of the Work site and/or Containment areas and removal surfaces will be conducted at this point by the **Asbestos Consultant** and encapsulation and/or containment disassembly shall not proceed until

discrepancies noted have been corrected.

Fourth Key Inspection:

Final Clearance: After encapsulation and final clean-up of the Work Area, but prior to removal of Critical Barriers, the **Asbestos Consultant** will conduct a visual inspection followed by final air tests. Final air sampling will be conducted in accordance with the Final Clearance Sections of this Specification.

Final Key Inspection:

Project Closeout Inspection: A final inspection will be conducted by the **Asbestos Consultant** after the **Contractor** has removed Critical Barriers, equipment, and supplies. A Project "Punch List" will be provided of any items requiring correction or completion. Punch List items shall be completed prior to issuance of final completion notice by the **Contractor**.

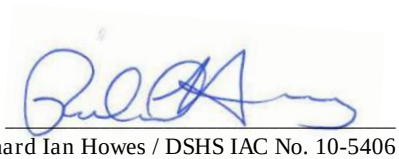
Discrepancies or needed corrective measures observed by the **Asbestos Consultant** will be reported to the **Contractor's** Superintendent on-site and shall be immediately corrected. The above inspections are not necessarily single events. Failed inspections will be re-conducted and time classified as retests and charged back to the **Contractor** in accordance with the project documents.

Inspections will require 24 hours advance notice to the **Asbestos Consultant**.

PERSONAL MONITORING:

The **Contractor** may perform personal air monitoring as required to meet OSHA requirements for maintenance of Time Weighted Average (TWA) and excursion limit fiber counts for types of respiratory protection provided. **The Consultant and/or Owner will not be providing air monitoring services to meet these OSHA requirements**. A listing of all personal air monitoring results obtained during the project will be submitted to the **Asbestos Consultant** with the **Contractor's** closeout submittals. The **Contractor** may, in lieu of performing personal air monitoring, submit to the **Asbestos Consultant** a Negative Initial Exposure Assessment listing personal air monitoring analytical results for similar projects performed on similar materials under similar working conditions.





Richard Ian Howes / DSHS IAC No. 10-5406
Expiration Date: March 21, 2018

LABORATORY TESTING:

The **Asbestos Consultant** will perform field analysis of the air samples obtained during the Project. A microscope and field laboratory will be set up at the jobsite or off-site, at the discretion of the **Asbestos Consultant**, so that verbal reports on analysis of air samples can be obtained promptly after collection.

Reports to the **Owner** by the **Asbestos Consultant** will include air monitoring data and pertinent information on work being conducted such as: work hours, number of workers, procedures used, contractor discrepancies and corrective measures, containment methods and construction, and amount of **ACM** removed.



Richard Ian Howes / DSHS IAC No. 10-5406
Expiration Date: March 21, 2018

## SURVEY CONTROL POINTS:

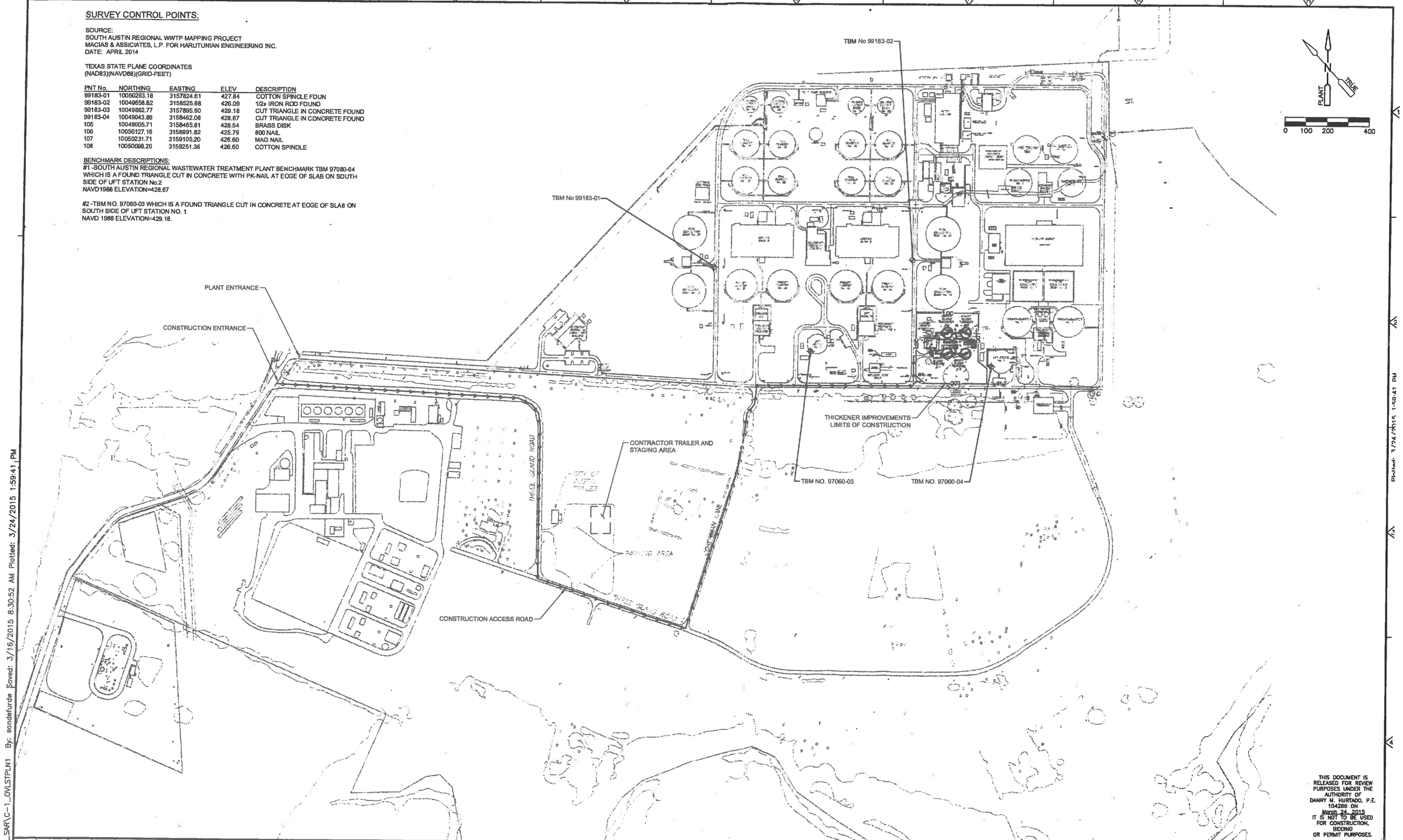
SOURCE:
SOUTH AUSTIN REGIONAL WWTP MAPPING PROJECT
MACIAS & ASSICIATES, L.P. FOR HARUTUNIAN ENGINEERING INC.
DATE: APRIL 2014

TEXAS STATE PLANE COORDINATES
(NAD83)(NAVD88)(GRID-FEET)

| PNT No. | NORTHING | EASTING | ELEV | DESCRIPTION |
|---|---|---|---|---|
| 99183-01 | 10050283.18 | 3157824.61 | 427.84 | COTTON SPINDLE FOUND |
| 99183-02 | 10049658.82 | 3158525.88 | 426.09 | 1/2" IRON ROD FOUND |
| 99183-03 | 10049862.77 | 3157895.60 | 429.18 | CUT TRIANGLE IN CONCRETE FOUND |
| 99183-04 | 10049043.86 | 3158462.08 | 428.67 | CUT TRIANGLE IN CONCRETE FOUND |
| 105 | 10049005.71 | 3158465.81 | 428.54 | BRASS DISK |
| 106 | 10050127.16 | 3158891.82 | 425.79 | 800 NAIL |
| 107 | 10050231.71 | 3159105.20 | 426.60 | MAG NAIL |
| 108 | 10050098.20 | 3159251.36 | 426.60 | COTTON SPINDLE |

BENCHMARK DESCRIPTIONS:
#1 -SOUTH AUSTIN REGIONAL WASTEWATER TREATMENT PLANT BENCHMARK TBM 97080-04 WHICH IS A FOUND TRIANGLE CUT IN CONCRETE WITH PK-NAIL AT EDGE OF SLAB ON SOUTH SIDE OF LIFT STATION No.2
NAVD1988 ELEVATION=428.67

#2 -TBM NO. 97060-03 WHICH IS A FOUND TRIANGLE CUT IN CONCRETE AT EDGE OF SLAB ON SOUTH SIDE OF LIFT STATION NO. 1
NAVD 1988 ELEVATION=429.18.

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| REV No | DATE | DRWN | CHKD | REMARKS |
|---|---|---|---|---|

DESIGNED BY: WOO
DRAWN BY: SANDEFUR
SHEET CHK'D BY: HURTADO
CROSS CHK'D BY:
APPROVED BY:
DATE: MARCH 2015

CDM Smith
Riata Corporate Park, 12357-A Riata Trace Parkway, Suite 210
Austin, TX 78727
Tel: (512) 346-1100

CITY OF AUSTIN, TEXAS - AUSTIN WATER UTILITY
CIP 3333.016

SOUTH AUSTIN REGIONAL WWTP
THICKENER IMPROVEMENTS PROJECT

OVERALL SITE AND
SURVEY CONTROL PLAN

PROJECT No 590--104217
FILE NAME: C-1_OVLSTPLN1

SHEET No
C-1

:\ACAD\104217_SAR\C-1_OVLSTPLN1 By: sandefurdw Saved: 3/16/2015 8:30:52 AM Plotted: 3/24/2015 1:59:41 PM

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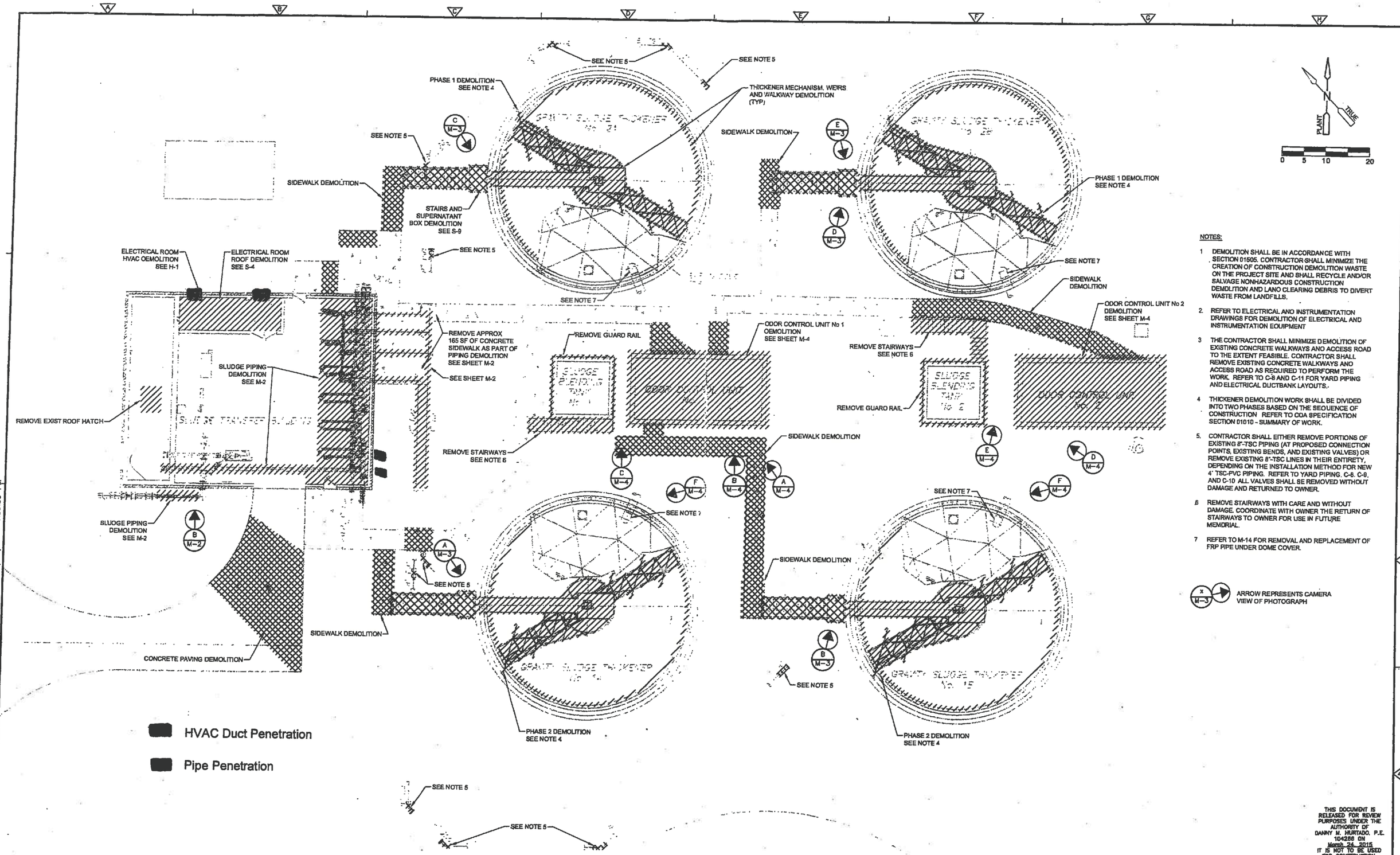


NOTES:

1 DEMOLITION SHALL BE IN ACCORDANCE WITH SECTION 01505. CONTRACTOR SHALL MINIMIZE THE CREATION OF CONSTRUCTION DEMOLITION WASTE ON THE PROJECT SITE AND SHALL RECYCLE AND/OR SALVAGE NONHAZARDOUS CONSTRUCTION DEMOLITION AND LAND CLEARING DEBRIS TO DIVERT WASTE FROM LANDFILLS.

2. REFER TO ELECTRICAL AND INSTRUMENTATION DRAWINGS FOR DEMOLITION OF ELECTRICAL AND INSTRUMENTATION EQUIPMENT

3 THE CONTRACTOR SHALL MINIMIZE DEMOLITION OF EXISTING CONCRETE WALKWAYS AND ACCESS ROAD TO THE EXTENT FEASIBLE. CONTRACTOR SHALL REMOVE EXISTING CONCRETE WALKWAYS AND ACCESS ROAD AS REQUIRED TO PERFORM THE WORK. REFER TO C-8 AND C-11 FOR YARD PIPING AND ELECTRICAL DUCTBANK LAYOUTS.

4 THICKENER DEMOLITION WORK SHALL BE DIVIDED INTO TWO PHASES BASED ON THE SEQUENCE OF CONSTRUCTION REFER TO COA SPECIFICATION SECTION 01010 - SUMMARY OF WORK.

5. CONTRACTOR SHALL EITHER REMOVE PORTIONS OF EXISTING 8"-TSC PIPING (AT PROPOSED CONNECTION POINTS, EXISTING BENDS, AND EXISTING VALVES) OR REMOVE EXISTING 8"-TSC LINES IN THEIR ENTIRETY, DEPENDING ON THE INSTALLATION METHOD FOR NEW 4" TSC-PVC PIPING. REFER TO YARD PIPING. C-8. C-9, AND C-10 ALL VALVES SHALL SE REMOVED WITHOUT DAMAGE AND RETURNED TO OWNER.

6 REMOVE STAIRWAYS WITH CARE AND WITHOUT DAMAGE. COORDINATE WITH OWNER THE RETURN OF STAIRWAYS TO OWNER FOR USE IN FUTURE MEMORIAL.

7 REFER TO M-14 FOR REMOVAL AND REPLACEMENT OF FRP PIPE UNDER DOME COVER.

X M-3 ARROW REPRESENTS CAMERA VIEW OF PHOTOGRAPH

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CAD\104217_SAR\C-2_EXSTPLN By: sandefurdw Sayed: 3/16/2015 8:35:35 AM Plotted: 3/24/2015 1:59:53 PM

Plotted: 1/24/2015 1:50:53 PM

| | |
|---|---|
| DESIGNED BY: | WOO |
| DRAWN BY: | SANDEFUR |
| SHEET CHK'D BY: | HURTADO |
| CROSS CHK'D BY: | |

CDM Smith
Rialto Corporate Park, 12357-A Rialto Trace Parkway Suite 210

CITY OF AUSTIN, TEXAS - AUSTIN WATER UTILITY
CIP 3333.016
SOUTH AUSTIN REGIONAL WWTP

EXISTING SITE AND DEMOLITION PLAN

PROJECT No 590-104217
FILE NAME: C-2_EXSTPLN
SHEET No

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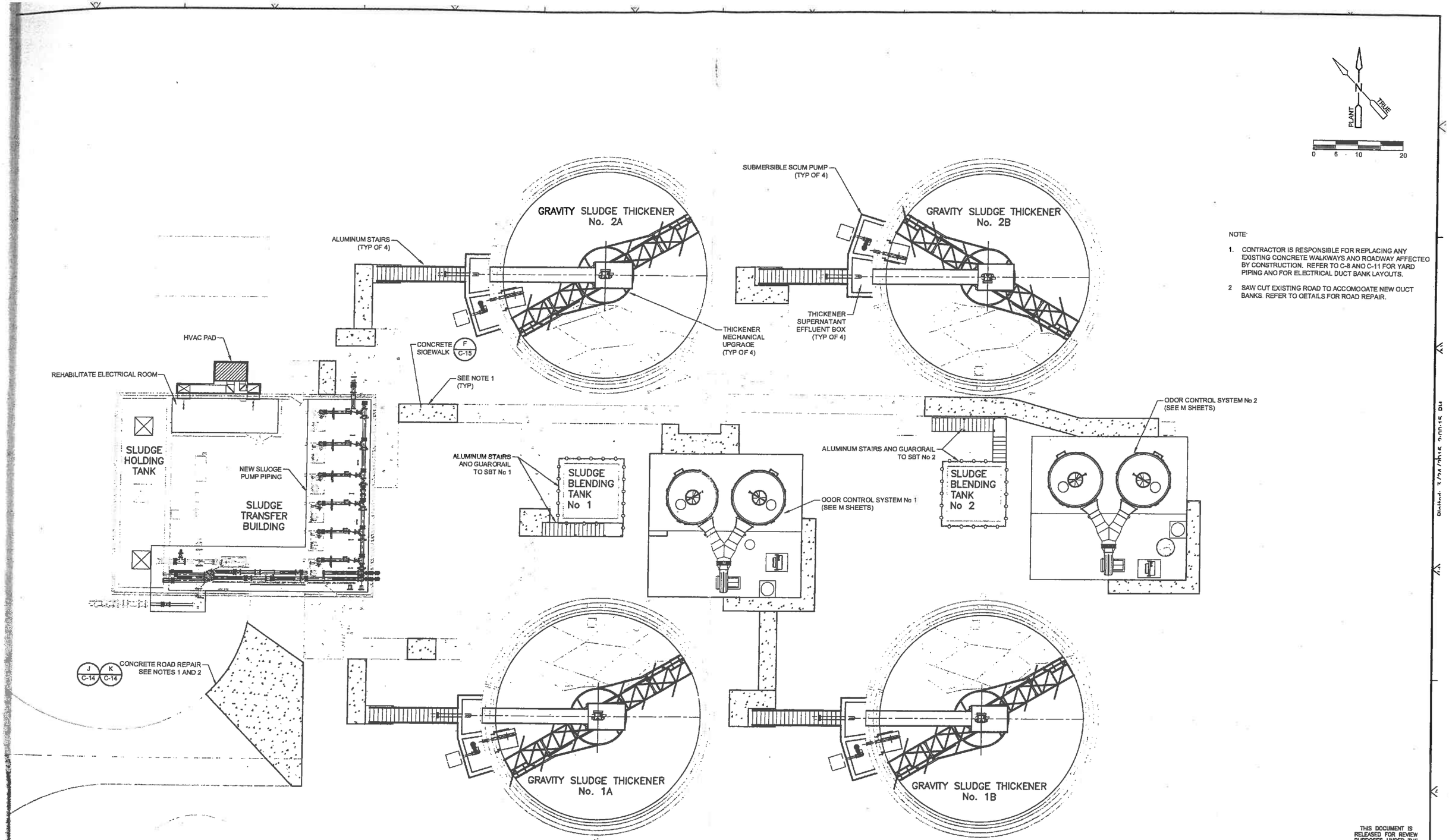


NOTE:

1. CONTRACTOR IS RESPONSIBLE FOR REPLACING ANY EXISTING CONCRETE WALKWAYS AND ROADWAY AFFECTED BY CONSTRUCTION. REFER TO C-8 AND C-11 FOR YARD PIPING AND FOR ELECTRICAL DUCT BANK LAYOUTS.
2. SAW CUT EXISTING ROAD TO ACCOMODATE NEW DUCT BANKS. REFER TO DETAILS FOR ROAD REPAIR.

THIS DOCUMENT IS RELEASED FOR REVIEW PURPOSES UNDER THE AUTHORITY OF DANNY M. HURTADO, P.E. 104266 ON March 24, 2015 IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING OR PERMIT PURPOSES.

| DATE | DRWN | CHKD | REMARKS |
|---|---|---|---|

DESIGNED BY: WOO
DRAWN BY: SANOEFUR
SHEET CHK'D BY: HURTADO
CROSS CHK'D BY:
APPROVED BY:
DATE: MARCH 2015

CDM Smith
Rialto Corporate Park, 12357-A Rialto Trace Parkway, Suite 210
Austin, TX 78727
Tel: (512) 346-1100
Texas Registration Number F-3043

CITY OF AUSTIN, TEXAS - AUSTIN WATER UTILITY
CIP 3333.016

SOUTH AUSTIN REGIONAL WWTP
THICKENER IMPROVEMENTS PROJECT

SITE PLAN

PROJECT No: 590-104217
FILE NAME: C-3_PRSTPLN

SHEET No
C-3

90% DESIGN - NOT FOR CONSTRUCTION

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# CERTIFICATE OF WORKER'S ACKNOWLEDGEMENT

PROJECT _____ DATE_____

PROJECT ADDRESS _____

SUBCONTRACTOR'S NAME_____

WORKING WITH ASBESTOS CAN BE DANGEROUS. INHALING ASBESTOS FIBERS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCER. IF YOU SMOKE AND INHALE ASBESTOS FIBERS THE CHANCE THAT YOU WILL DEVELOP LUNG CANCER IS GREATER THAN THAT OF THE NON-SMOKING PUBLIC.

Your employer's contract for the above project requires that: You be supplied with the proper respirator and be trained in its use. You be trained in safe work practices and in the use of the equipment found on the job. You receive a medical examination. These things are to have been done at no cost to you. By signing this certification you are assuring the owner that your employer has met these obligations to you.

RESPIRATORY PROTECTION: I have been trained in the proper use of respirators, and informed of the type respirator to be used on the above referenced project. I have a copy of the written respiratory protection manual issued by my employer. I have been equipped at no cost with the respirator to be used on the above project.

TRAINING COURSE: I have been trained in the dangers inherent in handling asbestos and breathing asbestos dust and in proper work procedures and personal and area protective measures. The topics covered in the course included the following:

- Physical characteristics of asbestos
- Health hazards associated with asbestos
- Respiratory protection
- Use of protective equipment
- Negative pressure systems
- Work practices including hands on or on-job training
- Personal decontamination procedures
- Air monitoring, personal and area

MEDICAL EXAMINATION: I have had a medical examination within the past 12 months which was paid for by my employer. This examination included: health history, pulmonary function tests and may have included an evaluation of a chest x-ray.

Signature _____

Printed Name _____

Social Security Number _____

Witness _____

**CERTIFICADO DE CONOCIMIENTO DEL TRABAJADOR:**
**(CERTIFICATE OF WORKER'S ACKNOWLEDGMENT: Spanish Version)**

NOMBRE DEL PROJECTO _____ FECHA _____

DOMICILIO DEL PROJECTO _____

NOMBRE DEL CONTRACTISTA _____

TRABAJAR CON ASBESTOS PUEDE SER PELIGROSO. EL RESPIRAR FIBRAS DE ASBESTOS A SIDO ASOCIADO CON VARIOS TIPOS DE CANCER. SI TU FUMAS Y RESPIRAS FIBRAS DE ASBESTOS, LAS POSIBILIDADES DE DESARROLLAR CANCER EN LOS PULMONES SON MAYORES QUE EN LAS PERSONAS QUE NO FUMAN.

El contrato de trabajo de tu patron con el dueño de este projecto requiere que: se te debe proporcionar un respirador apropiado y se te enseñe como usarlo. Tu debes ser entrenado para trabajar con medidas de seguridad y se te enseñe a usar el equipo y herramienta que se requiere para trabajar. Que seas examinado por un medico. Estas cosas deben ser hechas sin costo alguno para ti. Al firmar este certificado tu estas asegurando al dueno del projecto que tus patrones ya cumplieron con estas obligaciones (de proporcionarte equipo adecuado, entrenarte en practicas de seguridad y pasar por un chequeo medico). Por lo que se esta de acuerdo en mantener al dueño del projecto, sus consejeros, laboratorio de analisis y sus representantes fuera de responsabilidad en todas y cada una de las quejas que puedan resultar de, o relacionadas con este projecto.

PROTECCION RESPIRATORIA: Yo he sido entrenado en el use apropiado de respiradores, y he sido informado del tipo de respirador que debe ser usado en este projecto. Yo tengo una copia escrita del manual de proteccion respiratoria proporcionado por mis patrones. Yo he sido equipado sin costo alguno para me con el respirador que debe ser usado en este projecto.

CURSO DE ENTRENAMIENTO: Yo he sido entrenado en los peligros relacionados con el manejo de asbestos y con el respirar polvo de asbestos y he sido entrenado en los procedimientos de trabajo adecuados y medidas de proteccion personales en el area de trabajo. Los temas vistos en el curso incluyen los siguientes:

Caracteristicas fisicas de asbestos
Peligros de salud asociado con asbestos
Uso de equipo de proteccion
Sistemas de aire negativos
Practicas de trabajo mientras se trabaja o se entrena
Procedimientos de descontaminacion personal
Muestreo del aire, personal y del area

EXAMEN MEDICO: Yo he sido examinado dentro de lost ultimos 12 meses el cual fue pagado por mis patrones. Esta examinacion incluye: historia de salud, pruebas de funcion pulmonares y podria tener incluida una evaluacion de rayos x del torax.

Firma: _____

Nombre Escrito: _____

Numero Del Seguro Social: _____

Testigo: _____

## 102S.1 Description

This item shall govern the removal and disposal of all trees, stumps, brush, roots, shrubs, vegetation, logs, rubbish and other objectionable material.

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.

## 102S.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 clearing and grubbing materials and debris.

## 102S.3 Construction Methods

Prior to commencement of this work, all required erosion control and tree protection measures indicated on the Drawings shall be in place. The existing utilities shall be located and protected as specified in the Standard Contract Documents, Section 00700, "General Conditions" and/or indicated on the Drawings. A permit shall be required when utility adjustments are to be made in preparation for construction in the right-of-way, as specified in Section 5.2.0 of the City of Austin Utilities Criteria Manual.

Areas within the construction limits indicated on the Drawings shall be cleared of all trees, stumps, brush, etc., as defined in section 102S.1; except trees or shrubs scheduled for preservation which shall be carefully trimmed as directed, in accordance with Item No. 610S, " Preservation of Trees and Other Vegetation" and shall be protected from scarring, barking or other injuries during construction operations. All exposed cuts over 2 inches (50 millimeters) in diameter, exposed ends of pruned limbs or scarred bark shall be treated with an approved asphalt material within 24 hours of the pruning or injury.

Construction equipment shall not be operated nor construction materials stockpiled under the canopies of trees, unless otherwise indicated on the Drawings and/or specified in the Contract Documents. Excavation or embankment materials shall not be placed within the drip line of trees until tree wells are constructed.

Within the construction limits or areas indicated, all obstructions, stumps, roots, vegetation, abandoned structures, rubbish and objectionable material shall be removed to the following depths:

1. In areas to receive 6 inches (150 mm) or more embankment, a minimum of 12 inches (300 mm) below natural ground.

2. In areas to receive embankment less than 6 inches (150 mm), a minimum of 18 inches (450 mm) below the lower elevation of embankment, structure or excavation.
3. In areas to be excavated a minimum of 18 inches (450 mm) below the lower elevation of the embankment, structure or excavation.
4. In all other areas a minimum of 12 inches (300 mm) below natural ground.

Holes remaining after removal of all obstructions, objectionable material, trees, stumps, etc. shall be backfilled with select embankment material and compacted by approved methods. All cleared and grubbed material shall be disposed of in a manner satisfactory to the Engineer or designated representative. Unless otherwise provided, all materials as described above shall become the property of the Contractor and removed from the site and disposed of at a permitted disposal site.

Burning materials at the site shall conform to Standard Contract Document Section 01550, "Public Safety and Convenience".

**102S.4 Measurement**

"Clearing and Grubbing", when included in the contract as a pay item, will be measured by the acre (hectare: 1 hectare is equal to 2.471 acres), 100 foot (100 feet is equal to 30.5 meters) stations or lump sum, regardless of the width of the right of way.

**102S.5 Payment**

The work and materials presented herein will 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, unless specified as a separate pay item in the contract bid form. When included for payment, it shall be paid for at the unit bid price for "Clearing and Grubbing". This price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools, labor and incidentals necessary to complete the Work.

Payment, when included as a contract pay items, will be made under one of the following:

| | |
|---|---|
| **Pay Item No. 102S-A**: Clearing and Grubbing | Per Acre. |
| **Pay Item No. 102S-B**: Clearing and Grubbing | Per 100 foot Station. |
| **Pay Item No. 102S-C**: Clearing and Grubbing | Lump Sum. |

**End**

| **SPECIFIC** CROSS REFERENCE MATERIALS |
|---|
| Specification Item 102S, “CLEARING AND GRUBBING” |

City of Austin Standard Contract Documents

| Designation | Description |
|---|---|
| 00700 | General Conditions |
| 01550 | Public Safety and Convenience |

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. 110S | Street Excavation |
| Item No. 111S | Excavation |
| Item No. 610S | Preservation of Trees and Other Vegetation |

***RELATED*** CROSS REFERENCE MATERIALS

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 Contract Documents

| Designation | Description |
|---|---|
| 01500 | Temporary Facilities |

City of Austin Standard Specifications

| Designation | Description |
|---|---|
| Item No. 101S | Preparing Right of Way |
| Item No. 104S | Removing Portland Cement Concrete |
| Item No. 120S | Channel Excavation |
| Item No. 132S | Embankment |
| Item No. 201S | Subgrade Preparation |
| Item No. 203S | Lime Treatment for Materials In Place |
| Item No. 204S | Portland Cement Treatment for Materials In Place |
| Item No. 230S | Rolling (Flat Wheel) |
| Item No. 232S | Rolling (Pneumatic Tire) |
| Item No. 234S | Rolling (Tamping) |
| Item No. 236S | Rolling (Proof) |
| 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 |

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 |

***RELATED*** CROSS REFERENCE MATERIALS-Continued

Specification 102S, “CLEARING AND GRUBBING”

City of Austin Standard Details

| Designation | Description |
|---|---|
| 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 |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item No. 100 | Preparing Right of Way |
| Item No. 110 | Excavation |
| Item No. 112 | Subgrade Widening |
| Item No. 132 | Embankment |
| Item No. 150 | Blading |
| Item No. 158 | Specialized Excavation Work |
| Item No. 160 | Furnishing and Placing Topsoil |
| Item No. 164 | Seeding for Erosion Control |
| Item No. 204 | Sprinkling |
| Item No. 210 | Rolling (Flat Wheel) |
| Item No. 211 | Rolling (Tamping) |
| Item No. 213 | Rolling (Pneumatic Tire) |
| Item No. 260 | Lime Treatment for Materials Used as Subgrade (Road Mixed) |
| Item No. 265 | Lime-Fly Ash (LFA) Treatment for Materials Used as Subgrade |

Texas Department of Transportation:
Manual of Testing Procedures

| Designation | Description |
|---|---|
| Tex-103-E | Determination of Moisture Content of Soil Materials |
| Tex-105-E | Determination of Plastic Limit of Soils |
| Tex-106-E | Method of Calculating the Plasticity Index of Soils |
| Tex-114-E | Laboratory Compaction Characteristics and Moisture Density Relationship of Subgrade & Embankment Soil |
| Tex-115-E | Field Method for Determination of In-Place Density of Soils and Base Materials |

**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 |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| 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. 111S**
**Excavation**

## 111S.1 Description

This item shall govern: (1) the excavation and proper utilization or satisfactory disposal of all excavated materials, of whatever character, within the limits of the Work and (2) construction, compaction, shaping and finishing of all designated earthwork areas in accordance with the specification requirements outlined herein and in conformity with the required lines, grades and typical cross sections indicated on the Drawings or as directed by the Engineer or designated representative. When not otherwise included in the Contract Documents, this item shall include the work described in Specification Item Nos. 101S, "Preparing Right of Way", No. 102S, "Clearing and Grubbing", No. 104S, "Removing Portland Cement Concrete", No. 132S "Embankment" and No. 201S, "Subgrade Preparation".

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.

## 111S.2 Submittals

The submittal requirements of this specification item may include:

A. A permit when utility adjustments are made in the right-of-way,

B. A plan for removal and deposition of all 'Waste' materials, and

C. A Blasting Permit if blasting is required and allowed on the project.

## 111S.3 Classification

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

## 111S.4 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 shall be protected as specified in the Standard Contracts Document Section 00700, "General Conditions" and/or indicated on the Drawings. A permit shall be required when utility adjustments are to be made in preparation for construction in the right-of-way, as specified in Section 5.2.0 of the City of Austin Utilities Criteria Manual.

Construction equipment shall not be operated nor construction materials stockpiled under the canopies of trees, unless otherwise indicated on the Drawings. Excavation or embankment materials shall not be placed within the drip line of trees until tree wells are constructed, that conform to Specification Item No. 610S, “Preservation of Trees and Other Vegetation”.

All excavation shall be performed as specified herein and shall conform to the established alignment, grades and cross sections indicated on the Drawings. Suitable excavated

materials shall be utilized, insofar as practical, in constructing required embankments. The construction of all embankments shall conform to Specification Item No. 132S, "Embankment". No material shall be stockpiled within the banks of a waterway.

Unsuitable excavated materials or excavation in excess of that needed for construction shall be known as "Waste" and shall become the property of the Contractor. Unsuitable material encountered below the subgrade elevation in roadway cuts, when declared “Waste” by the Engineer or designated representative, shall be replaced with material from the roadway excavation or with other suitable material as approved by the Engineer. It shall become the Contractor’s responsibility to dispose of this material off the limits of the right of way in an environmentally sound manner at a permitted disposal site.

All blasting shall conform to the Provisions of the Standard Contract Document Section 01550, "Public Safety and Convenience". In all cases, a Blasting Permit must be obtained in advance from the City of Austin, Department of Public Works and Transportation.

Adequate dewatering and drainage of excavation shall be maintained throughout the time required to complete the excavation work.

### 111S.5 Measurement

All accepted excavation will be measured by either Method A or B as follows:

(1) Method A

Measurement of the volume of excavation in cubic yards (cubic meters: 1 square meter is equal to 1.306 square yards) by the average end area methods. Cross-sectional areas shall be computed from the existing ground surface to the established line of the subgrade, as shown on typical sections in the Drawings, over the limits of the right of way or other work limits, including parkway slopes and sidewalk areas.

(2) Method B

Measurement of the volume of excavation in cubic yards (cubic meters: 1 square meter is equal to 1.306 square yards), based upon the average end area method taken from pre-construction cross sections and planned grades. The planned quantities for excavation will be used as the measurement for payment for this item.

### 111S.6 Payment

This item will be paid for at the contract unit bid price for "Excavation", as provided under measurement Method A or B as included in the bid. The bid price shall include full compensation for all work herein specified including dewatering, drainage, subgrade preparation, unless otherwise indicated, and the furnishing of all materials, equipment, tools, labor and incidentals necessary to complete the work.

Payment will be made under one of the following:

| | | |
|---|---|---|
| **Pay Item No. 111S-A:** | Excavation | Per Cubic Yard. |
| **Pay Item No. 111S-B:** | Excavation, Plan Quantity | Per Cubic Yard. |

**End**

| ***SPECIFIC*** CROSS REFERENCE MATERIALS |
|---|
| Specification Item 111S, "EXCAVATION" |

City of Austin Standard Contract Documents

| Designation | Description |
|---|---|
| 00700 | General Conditions |
| 01550 | Public Safety and Convenience |

City of Austin Utilities Criteria Manual

| Designation | Description |
|---|---|
| Section 5.2.0 | Permit for Excavation in the Public Right-of-Way |

City of Austin Technical Specifications

| Designation | Description |
|---|---|
| Item No. 101S | Preparing Right of Way |
| Item No. 102S | Clearing and Grubbing- |
| Item No. 104S | Removing Portland Cement Concrete |
| Item No. 132S | Embankment |
| Item No. 201S | Subgrade Preparation |
| Item No. 236S | Proof Rolling |
| Item No. 610S | Preservation of Trees and Other Vegetation |

| ***RELATED*** CROSS REFERENCE MATERIALS |
|---|
| Specification Item 111S, "EXCAVATION" |

City of Austin Standard Contract Documents

| Designation | Description |
|---|---|
| 01500 | Temporary Facilities |

City of Austin Standard Specifications

| Designation | Description |
|---|---|
| Item No. 120S | Channel Excavation |
| Item No. 203 | Lime Treatment for Materials In Place |
| Item No. 204S | Portland Cement Treatment for Materials In Place |
| Item No. 230S | Rolling (Flat Wheel) |
| Item No. 232S | Rolling (Pneumatic Tire) |
| Item No. 234S | Rolling (Tamping) |
| 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 |

City of Austin Standard Details

| Designation | Description |
|---|---|
| No. 610S-1 | Tree Protection Fence Locations |
| No. 610S-2 | Tree Protection Fence, Type B Chainlink |
| No. 610S-3 | Tree Protection Fence, Type B Wood |
| No. 610S-4 | Tree Protection Fence, Modified Type A |

| | |
|---|---|
| No. 610S-5 | Tree Protection Fence, Modified Type B |
| No. 621S-1 | Diversion |
| No. 622S-1 | Diversion Dike |
| No. 624S-1 | Earth Outlet Sediment Trap |
| No. 625S-1 | Grade Stabilization Structure |
| No. 627S-1 | Grass Lined Swale |
| No. 627S-2 | Grass Lined Swale With Stone Center |
| No. 628S | Triangular Sediment Filter Dike |

City of Austin Standard Details

| Designation | Description |
|---|---|
| No. 628S-1 | Hay Bale Dike |
| No. 629S-1 | Brush Berm |
| No. 630S-1 | Interceptor Dike |
| No. 631S-1 | Interceptor Swale |
| No. 632S-1 | Storm Inlet Sediment Trap |
| No. 633S-1 | Landgrading |
| No. 634S-1 | Level Spreader |
| No. 635S-1 | Perimeter Dike |
| No. 636S-1 | Perimeter Swale |
| No. 637S-1 | Pipe Slope Drain (Flexible) |
| No. 637S-2 | Pipe Slope Drain (Flexible) |
| No. 638S-1 | Pipe Outlet Sediment Trap |
| No. 639S-1 | Rock Berm |
| No. 641S-1 | Stabilized Construction Entrance |
| No. 642S-1 | Silt Fence |
| No. 643S-1 | Stone Outlet Structure |
| No. 644S-1 | Stone Outlet Sediment Trap |

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 |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item No. 100 | Preparing Right of Way |
| Item No. 110 | Excavation |
| Item No. 112 | Subgrade Widening |
| Item No. 132 | Embankment |
| Item No. 150 | Blading |
| Item No. 158 | Specialized Excavation Work |
| Item No. 160 | Furnishing and Placing Topsoil |
| Item No. 164 | Seeding for Erosion Control |
| Item No. 204 | Sprinkling |
| Item No. 210 | Rolling (Flat Wheel) |
| Item No. 211 | Rolling (Tamping) |
| Item No. 213 | Rolling (Pneumatic Tire) |
| Item No. 260 | Lime Treatment for Materials Used as Subgrade (Road Mixed) |
| Item No. 265 | Lime-Fly Ash (LFA) Treatment for Materials Used as Subgrade |

Texas Department of Transportation: Manual of Testing Procedures

| Designation | Description |
|---|---|
| Tex-103-E | Determination of Moisture Content of Soil Materials |
| Tex-104-E | Determination of Liquid Limit of Soils |
| Tex-105-E | Determination of Plastic Limit of Soils |
| Tex-106-E | Method of Calculating the Plasticity Index of Soils |
| Tex-114-E | Laboratory Compaction Characteristics and Moisture-Density Relationship of Subgrade & Embankment Soil |
| Tex-115-E | Field Method for Determination of In-Place Density of Soils and Base Materials |

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**Item No. 130S**
**Borrow**

## 130S.1 Description

This item shall govern required excavation, removal and proper utilization of materials secured from sources, selected by the Contractor and approved by the Engineer or designated representative. The compaction of embankments constructed from borrow as provided herein shall conform to the appropriate sections of Specification Item Nos. 132S, "Embankment" and 236S, “Proof Rolling”.

Borrow will be used only when indicated on the Drawings or directed by the Engineer or designated representative and shall only be acquired from approved sources.

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.

## 130S.2 Submittals

The submittal requirements of this specification item may include:

A. Identification of Class, source and characteristics (P.I., linear shrinkage, etc.) of proposed borrow material, and
B. A plan for managing and maintaining borrow sites.

## 130S.3 Materials

All authorized borrow shall conform to one of the following classes:

Class A (Select Borrow)

Class A Borrow material shall consist of suitable granular material, free from vegetation or other objectionable matter and reasonably free from lumps of earth. When tested by standard TxDOT laboratory methods Tex-105-E, Tex-106-E and Tex-107-E, the Class A Select Borrow, shall meet the following requirements:

| | |
|---|---|
| The Liquid Limit shall not exceed | 45 |
| The Plasticity Index shall not exceed | 15 |
| The bar linear shrinkage shall not be less than | 2 |

Class B (Borrow)

Class B Borrow material shall consist of suitable non swelling [i.e. soils with a plasticity index (P.I.) less than 20] earth material such as loam, clay or other such materials that will form a stable embankment.

Class C (Topsoil)

See Standard Specification Item No. 601S.3(A)

### 130S.4 Construction Methods

Prior to commencing this work, all required erosion control and environmental measures shall be in place. All suitable materials removed from excavations shall be used, insofar as practicable in the formation of embankments conforming to Specification Item No. 132S, "Embankment", as otherwise indicated on the Drawings or as directed by the Engineer or designated representative. The completed work shall conform to the established alignment, grades and cross section as shown on the Drawings. The additional material necessary to complete the work described above shall be "Borrow" of the class specified.

The Contractor shall arrange for borrow from one of the following sources:

1. Existing borrow pit,
2. New borrow pit, or
3. Surplus excavated material from a site, with a site development permit.

The Contractor shall notify the Engineer 3 weeks prior to opening a pit or any other borrow source to allow necessary testing for approval of materials. All borrow sites shall comply with the requirements of the site development permit.

During construction, borrow sources shall be kept drained to permit final cross sections to be measured, when required.

Borrow sites shall be managed and maintained to minimize the impact of the appearance of the natural topographic features and at no time create a potential hazard to the public.

### 130S.5 Measurement

Borrow will be measured by the cubic yard (cubic meters: 1 cubic meter is equal to 1.196 cubic yards) in its final position based upon the average end areas, calculated from pre-construction cross sections and plan grades. The plan quantities for Borrow or Topsoil will be used as the measurement for payment for this item.

### 130S.6 Payment

All work performed as required herein and measured as provided under "Measurement" will be paid for at the unit bid price. The bid prices shall include full compensation for furnishing all labor; all materials; all royalty and freight involved; all hauling and delivering on the road; and all tools, equipment and incidentals necessary to complete the work. Payment will not be made for unauthorized work.

Payment will be made under one of the following:

| | | |
|---|---|---|
| **Pay Item No. 130S-A**: | Class A (Select Borrow), Plan Quantity | Per Cubic Yard. |
| **Pay Item No. 130S-B**: | Class B (Borrow), Plan Quantity | Per Cubic Yard. |
| **Pay Item No. 130S-T**: | Class C (Topsoil), Plan Quantity | Per Cubic Yard. |

**End**

| ***SPECIFIC*** CROSS REFERENCE MATERIALS |
|---|
| Specification 130S, "BORROW" |

City of Austin Standard Specifications

| Designation | Description |
|---|---|
| Item No. 132S | Embankment |
| Item No. 236S | Rolling (Proof) |

Texas Department of Transportation: Manual of Testing Procedures

| Designation | Description |
|---|---|
| Tex-105-E | Determination of Plastic Limit of Soils |
| Tex-106-E | Method of Calculating the Plasticity Index of Soils |
| Tex-107-E | Determination of Bar Linear Shrinkage of Soils |

| ***RELATED*** CROSS REFERENCE MATERIALS |
|---|
| Specification 130S, "BORROW" |

City of Austin Standard Contract Documents

| Designation | Description |
|---|---|
| 00700 | General Conditions |

City of Austin Standard Specifications

| Designation | Description |
|---|---|
| Item No. 101S | Preparing Right of Way |
| Item No. 102S | Clearing and Grubbing |
| Item No. 110S | Street Excavation |
| Item No. 111S | Excavation |
| Item No. 230S | Rolling (Flat Wheel) |
| Item No. 232S | Rolling (Pneumatic Tire) |
| Item No. 234S | Rolling (Tamping) |
| Item No. 602S | Sodding for Erosion Control |
| Item No. 604S | Seeding for Erosion Control |
| Item No. 610S | Preservation of Trees and Other Vegetation |
| Item No. 622S | Diversion Dike |
| Item No. 628S | Sediment Containment Dikes |
| Item No. 642S | Silt Fence |

City of Austin Standard Details

| Designation | Description |
|---|---|
| No. 610S-1 | Tree Protection Fence Locations |
| No. 610S-2 | Tree Protection Fence, Type B Chainlink |
| No. 610S-3 | Tree Protection Fence, Type B Wood |
| No. 610S-4 | Tree Protection Fence, Modified Type A |
| No. 610S-5 | Tree Protection Fence, Modified Type B |
| No. 621S-1 | Diversion |
| No. 622S-1 | Diversion Dike |
| No. 624S-1 | Earth Outlet Sediment Trap |
| No. 625S-1 | Grade Stabilization Structure |
| No. 626S-1 | Grass Lined Swale |
| No. 627S-1 | Grass Lined Swale With Stone Center |
| No. 628S | Triangular Sediment Filter Dike |

| | |
|---|---|
| No. 628S-1 | Hay Bale Dike |
| No. 629S-1 | Brush Berm |
| No. 630S-1 | Interceptor Dike |
| No. 631S-1 | Interceptor Swale |
| No. 632S-1 | Storm Inlet Sediment Trap |
| No. 633S-1 | Landgrading |
| No. 634S-1 | Level Spreader |

City of Austin Standard Details

| Designation | Description |
|---|---|
| No. 635S-1 | Perimeter Dike |
| No. 636S-1 | Perimeter Swale |
| No. 637S-1 | Pipe Slope Drain (Flexible) |
| No. 637S-2 | Pipe Slope Drain (Flexible) |
| No. 638S-1 | Pipe Outlet Sediment Trap |
| No. 639S-1 | Rock Berm |
| No. 641S-1 | Stabilized Construction Entrance |
| No. 642S-1 | Silt Fence |
| No. 643S-1 | Stone Outlet Structure |
| No. 644S-1 | Stone Outlet Sediment Trap |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item No. 100 | Preparing Right of Way |
| Item No. 110 | Excavation |
| Item No. 132 | Embankment |
| Item No. 158 | Specialized Excavation Work |
| Item No. 160 | Furnishing and Placing Topsoil |
| Item No. 164 | Seeding for Erosion Control |
| Item No. 204 | Sprinkling |
| Item No. 210 | Rolling (Flat Wheel) |
| Item No. 211 | Rolling (Tamping) |
| Item No. 213 | Rolling (Pneumatic Tire) |

Texas Department of Transportation: Manual of Testing Procedures

| Designation | Description |
|---|---|
| Tex-103-E | Determination of Moisture Content of Soil Materials |
| Tex-104-E | Determination of Liquid Limit of Soils |
| Tex-114-E | Laboratory Compaction Characteristics and Moisture-Density Relationship of Subgrade & Embankment Soil |
| Tex-115-E | Field Method for Determination of In-Place Density of Soils and Base Materials |

**Item No. 201S**
**Subgrade Preparation**

## 201S.1 Description

This item shall govern scarifying; blading and rolling the subgrade to obtain a uniform texture and provide as nearly as practicable a uniform density for the top 6 inches (150 mm) of the subgrade.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

## 201S.2 Submittals

The submittal requirements of this specification item may include:

A. A plan identifying classification and characteristics (P.I., optimum moisture-density, etc.) of insitu subgrade soils, as well as the source, classification and characteristics of any proposed borrow material,
B. Type and size of equipment proposed to produce the required compaction, and
C. Compaction (moisture-density, etc) test results for in-situ subgrade soils and/or borrow materials.

## 201S.3 Construction Methods

Prior to initiation of subgrade preparation activities, all operations involving Standard Specification Item No. 101S," Preparing Right of Way" and/or Standard Specification Item No. 102S, "Clearing and Grubbing" shall be completed. The surface of the subgrade shall be scarified and shaped in conformity with the typical sections and the lines and grades indicated on the Drawings; by the removal of existing material or addition of approved material as established by the Engineer or designated representative. Any deviation in the subgrade cross section which exceeds 1/2 inch in a length of 10 feet (12 mm in a length of 3 meters), measured longitudinally, shall be corrected by loosening, adding or removing material, and then reshaping and compacting by sprinkling and rolling.

All unsuitable material shall be removed and replaced with approved material. All foundations, walls or other objectionable material shall be removed in accordance with Standard Specification Item No. 104S, "Removing Portland Cement Concrete" to a minimum depth of 18 inches (450 mm) under all structures and 12 inches (300 mm) under areas to be vegetated. All holes, ruts and depressions shall be filled with approved material and compacted by approved methods.

The subgrade shall be prepared sufficiently in advance to insure satisfactory prosecution of the Work. The Contractor will be required to set blue tops for the subgrade on the centerline, at the quarter points and along the curb lines or edge of pavement at maximum intervals of 50 feet (15 meters). The subgrade shall be tested by proof rolling

in conformity with Standard Specification Item No. 236S, "Proof Rolling" prior to placement of the first course of base material. Any unstable or spongy subgrade areas identified by proof rolling shall be corrected either by additional re-working, drying and compaction, or by removal and replacement of unsuitable materials. When specifically directed by the Engineer or designated representative, the Contractor shall re-work the subgrade* as follows:

A. Remove the unstable subgrade to the full depth of the unstable insitu material or to a minimum depth of 6 inches (150 mm), whichever is greater;
B. Spread the material over a sufficient area to allow reworking of the excavated material;
C. Disc, scarify or otherwise breakup the excavated material and allow to dry (Note: If approved by the Engineer or designated representative, the addition of lime or other additive may be used to aid in the drying process or to stabilize the unstable material);
D. Fill the excavated area with the re-worked material and compact to specified densities; and
E. Proof roll the re-worked area.

* The Rework process will not be allowed for unstable organic subgrade soils. These type soils will be permanently removed and replaced with materials approved by the Engineer or designated representative.

All suitable material removed in accordance with Standard Specification Item No, 111S, "Excavation", may be utilized in the subgrade with the approval of the Engineer or designated representative. All other material required for completion of the Subgrade, including those defined in accordance with Specification Item No. 130S, "Borrow", shall also be subject to approval by the Engineer or designated representative.

It is the intent of this specification to provide the required density and moisture control for the subgrade based on the plasticity characteristics of the approved materials. The subgrade materials shall be sprinkled as required and compacted to the extent necessary to provide the density specified below, unless otherwise indicated on the Drawings. The Plasticity Index (P.I.) will be established in accordance with TxDOT Test Methods Tex-104-E, Tex-105-E and Tex-106-E. The density determination will be made in accordance with TxDOT Test Method Tex-114-E and field density measurements will be made in accordance with TxDOT Test Method Tex-115-E.

| Description | Density, Percent | Moisture |
|---|---|---|
| Non-swelling Soils (P.I. less than 20) | Not less than 95 | |
| Swelling Soils (P.I. between 20 and 35) | Not less than 95 nor more than 102 | Not less than optimum |
| Swelling Soils (P.I. greater than 35) | Not less than 95 nor more than 100 | Not less than optimum |

Subgrade materials on which planting or turf will be established shall be compacted to a minimum of 85 percent of the density as determined in accordance with TxDOT Test

Method Tex-114-E. Field tests for density in accordance with TxDOT Test Method Tex-115-E will be made as soon as possible after compaction operations are completed. If the material fails to meet the density specified, it shall be reworked as necessary to obtain the density required.

Prior to placement of any base materials, the in-place density and moisture content of the top 6 inches (150 mm) of compacted subgrade shall be checked. If the tests indicate that the relative density and moisture do not meet the limits specified in the table above, the subgrade shall be reworked as necessary to obtain the specified compaction and moisture content. All initial testing will be paid for by the City of Austin. All retesting shall be paid for by the Contractor.

### 201S.4 Measurement

All acceptable subgrade preparation when included in the contract as a separate pay item, will be measured by the square yard (square meter: 1 square meter equals 1.196 Square yards). The measured area includes the entire width of the roadway for the entire length as indicated on the Drawings.

### 201S.5 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 as a separate pay item in the contract bid form, subgrade preparation shall be measured as specified above and paid for at the contract unit bid price for "Subgrade Preparation". The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

Payment, when included as a contract pay item, will be made under:

**Pay Item No. 201S**: Subgrade Preparation Per Square Yard.

**End**

| ***SPECIFIC*** CROSS REFERENCE MATERIALS |
|---|
| Specification Item 201S, "SUBGRADE PREPARATION" |

City of Austin Standard Specification Items

| Designation | Description |
|---|---|
| Item No. 101S | Preparing Right of Way |
| Item No. 102S | Clearing and Grubbing |
| Item No. 104S | Removing Portland Cement Concrete |
| Item No. 110S | Street Excavation |
| Item No. 111S | Excavation |
| Item No. 130S | Borrow |
| Item No. 236S | Proof Rolling |

Texas Department of Transportation: Manual of Testing Procedures

| Designation | Description |
|---|---|
| Tex-103-E | Determination of Moisture Content of Soil Materials |
| Tex-104-E | Determination of Liquid Limit of Soils |
| Tex-105-E | Determination of Plastic limit of Soils |
| Tex-106-E | Method of Calculating the Plasticity Index of Soils |
| Tex-114-E | Laboratory Compaction Characteristics & Moisture Density Relationship of Subgrade & Embankment Soil |
| Tex-115-E | Field Method for Determination of In-Place Density of Soils & Base Materials |

| ***RELATED*** CROSS REFERENCE MATERIALS |
|---|

City of Austin Standard Specifications

| Designation | Description |
|---|---|
| Item No.132S | Embankment |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item No. 100 | Preparing Right of Way |
| Item No. 110 | Excavation |
| Item No. 112 | Subgrade Widening |
| Item No. 132 | Embankment |
| Item No. 150 | Blading |
| Item No. 158 | Specialized Excavation Work |
| Item No. 204 | Sprinkling |
| Item No. 210 | Rolling (Flat Wheel) |
| Item No. 211 | Rolling (Tamping) |
| Item No. 213 | Rolling (Pneumatic Tire) |

Texas Department of Transportation: Manual of Testing Procedures

| Designation | Description |
|---|---|
| Tex-103-E | Determination of Moisture Content of Soil Materials |

**Item No. 204S**
**Portland Cement Treatment for Materials in Place**

## 204S.1 Description

This item shall govern the treatment of materials in place by pulverizing soil or aggregate materials, adding Portland cement, mixing, wetting and then compacting the treated material to the required density, as herein specified and in conformity with the typical sections, lines, grades and thickness as shown on the Drawings or as established by the Engineer or designated representative. This item applies to natural subgrade soils, embankment materials, new base or existing base (with or without asphaltic concrete pavement layers) or combinations as shown 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.

## 204S.2 Submittals

The submittal requirements of this specification item may include:

A. A mix design identifying classification of in-place materials, type of cement, source of water and quantities of cement and water required in the proposed application to yield the specified compressive strength requirements, and

B. An update in the mix design, if source of material changes during construction,

C. A plan describing the construction equipment proposed for the work and identifying the type and condition of each equipment item.

## 204S.3 Materials

A. Soil

Soil shall consist of approved material, free from vegetation or other objectionable matter, encountered in the existing roadway and/or other acceptable embankment or borrow material selected for use in preparation of the roadway in accordance with this specification.

B. Portland Cement

Portland cement shall be either Type 1, 1P or II and shall conform to TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges Item No. 524.

The Contractor may use bag or bulk cement.

C. Water

Water shall be free from oils, acids, organic matter or other substances deleterious to the cement treatment of materials. The water shall not contain more than 1000 parts per million of chlorides as Cl nor more than 1000 parts per million of sulfates as SO4. Water from municipal supplies approved by the State Health Department will not require testing, but water from other sources will be sampled and tested in accordance with AASHTO T-26. The water source shall be approved by the Engineer or designated representative.

**204S.4 Equipment**

The equipment utilized for materials, which are specified to be measured or proportioned by weight (mass) shall be approved by the Engineer or designated representative. Prior to the start of construction operations the equipment necessary for the proper construction of the work shall be on the project site, in first class working condition and approved by the Engineer or designated representative, both as to type and condition. The Contractor shall at all times provide sufficient equipment to enable continuous prosecution of the work and to insure completion in the required number of working days.

"Portland Cement Treatment for Materials in Place" may be constructed with any machine or combination of machines and auxiliary equipment that will produce results as outlined in this specification.

Mixing may be accomplished by (1) a multiple-pass traveling mixing plant or (2) a single-pass traveling mixing plant.

The equipment provided by the Contractor shall be operated by experienced and capable workers and shall be that necessary to provide a cement treatment meeting the requirements herein specified.

**204S.5 Mix Design**

Cement content will be selected by the Engineer or designated representative, based on compressive strength test results from a testing laboratory approved by the City of Austin. The mix design shall meet the strength requirements as shown on the Drawings or indicated in the Specifications.

Unless otherwise indicated in the Drawings or established by the Engineer or designated representative, the mix will be designed with the intention of producing a minimum average 7 day compressive strength of 400 pounds per square inch (2750 kilopascals) using the unconfined compression testing procedures described in TxDOT Test Method Tex-120-E.

When material properties or sources change, Contractor shall provide additional mix design tests and adjust the cement content as necessary to meet the compressive strength requirements.

## 204S.6 Construction Methods

A. General

Prior to commencement of this work, all required erosion control and tree protection measures shall be in place and the utilities located and protected as specified in the City of Austin Standard Contract Document Section 00700, "General Conditions".

Construction equipment shall not be operated within the drip line of trees unless otherwise indicated on the Drawings. Construction materials shall not be stockpiled under the canopies of trees. Excavation or embankment materials shall not be placed within the drip line of trees until tree wells are constructed.

It is the primary requirement of this specification to secure a uniformly treated course of cement treated material, free from loose or segregated areas, of uniform density and moisture content, well bound for its full depth and with a smooth surface suitable for placing subsequent courses.

B. Preparation of Subgrade or existing surface

Prior to scarifying or pulverizing the existing material, the subgrade or existing surface shall be graded and shaped as required to construct the "Portland Cement Treatment for Materials in Place" in conformance with the lines, grades, thickness and cross section indicated on the Drawings or as approved by the Engineer or designated representative. Unsuitable material shall be removed and replaced with acceptable material.

The Contractor shall proof roll the subgrade or existing surface in accordance with Standard Specification Item No, 236S. The subgrade or existing surface shall be firm and able to support without displacement the construction equipment and the compaction hereinafter specified. Soft or yielding subgrade shall be corrected and made stable before construction proceeds.

When the Contractor elects to use a cutting and pulverizing machine that will process the material to the specified depth, the Contractor will not be required to excavate to the secondary grade or windrow the material. This method will be permitted only if a machine is provided which will insure that the material is cut uniformly to the proper depth and which has cutters that will plane the secondary grade to a smooth surface over the entire width of the cut. The machine shall be of such design that a visible indication is provided at all times that the machine is cutting to the proper depth. If the machine fails to achieve the proper cutting depth, it shall be removed from the project or adjusted to the satisfaction of the Engineer or designated representative to accomplish the work as specified

In lieu of using the cutting and pulverizing machine, the Contractor shall excavate and windrow the material to expose the secondary grade to the typical sections, lines and grades as shown on the Drawings or as established by the Engineer or

designated representative. The windrowed material shall be uniformly replaced before the cement is applied.

C. Pulverization

The existing subgrade material to be stabilized shall be so pulverized that, a minimum of 80 percent passes a No. 4 (4.75 mm) sieve, exclusive of gravel or stone retained on this sieve. When shown on the Drawings or approved by the Engineer or designated representative, this pulverization requirement may be waived if the material contains a substantial amount of aggregate.

Existing asphaltic concrete wearing surfaces, subbases and bases shall be pulverized so that 100 percent will pass a 2 inch (50 mm) sieve.

D. Application of Cement (Roadmix)

It shall be the responsibility of the Contractor to (1) regulate the sequence of work, (2) process a sufficient quantity of material to provide full depth as indicated on the Drawings, (3) use the proper amount of Portland cement, that is established by the approved job mix design or approved by the Engineer or designated representative and (4) maintain the work and rework the courses as necessary to meet the design strength requirements.

The cement shall be spread by an approved spreader or by bag distribution. It shall be distributed at a uniform rate and in such a manner as to reduce to a minimum the scattering of cement by wind. Cement treatment shall not be mixed or placed when the wind velocity exceeds 15 miles (25 kilometers) per hour or when the air temperature is below 400F (40C) and falling, but may be mixed or placed when the air temperature is above 350F (20C) and rising. The temperature shall be taken in the shade and away from artificial heat. In any event cement treatment shall be mixed or placed only when weather conditions, in the opinion of the Engineer or designated representative, are suitable. If a bulk cement spreader is used, it shall be positioned with string lines or other approved method during spreading to insure a uniform distribution of cement.

Cement shall be applied only in that area where the mixing, compacting and finishing operations can be continuous and completed in daylight within 6 hours of such application.

The percentage of moisture in the soil at the time of cement application shall not exceed the quantity that will permit uniform and intimate mixture of material and cement during dry mixing operations. The percentage of moisture in the soil at the time of cement application shall not exceed the optimum moisture content for the cement-stabilized mixture.

No equipment, except that used in spreading and mixing, will be allowed to pass over the freshly spread cement until it is mixed.

E. Mixing and Processing

Either single or multiple soil stabilizer mixers shall be used.

After any required mixing of the material(s), the cement shall be dry mixed with the material(s) prior to the addition of water. Immediately after dry mixing, water shall

be uniformly applied. After mixing, the mixture shall be in a loose, evenly spread state ready for compaction. The mixture shall be mixed and compacted in one (1) lift.

The mixer shall be provided with means for the visible and accurate gauging of the water application. The water shall be uniformly applied through a pressure spray bar.

After the cement is spread, the mixing operation shall proceed as follows:

1. The mixer shall in one continuous operation: mix the air-dry material and cement to the full depth indicated on the Drawings, provide for the addition of water uniformly, thoroughly moist-mix the material, cement and water, spread the completed cement mixture evenly over the machine processed width of the subgrade, and leave it in a loose condition ready for immediate compaction.

2. The stabilized cement mixture shall not remain undisturbed after mixing and before compacting for more than 30 minutes.

F. Compaction

Unless otherwise shown on the Drawings or established by the Engineer or designated representative, the cement treated course shall be sprinkled as required herein and compacted to the extent necessary to provide not less than 95 percent of the density as determined by TxDOT Test Method Tex-120-E, Part II. The in place roadway density will be determined by TxDOT Test Method Tex-115-E.

At the start of compaction, the percentage of moisture in the mixture and in unpulverized soil lumps, shall be within 2 percentage points either side of the specified optimum moisture content as determined by TxDOT Test Method Tex-120-E, unless otherwise approved by the Engineer or designated representative. The percent of moisture will be determined in accordance with TxDOT Test Method Tex-103-E.

If the percent of moisture is outside the allowable tolerance, the Contractor shall adjust operations to meet this requirement. When the uncompacted cement stabilized mixture is wetted by rain so that the average moisture content exceeds the specified tolerance at the time of final compaction, the entire section shall be reconstructed in accordance with this specification at the sole expense of the Contractor.

When the material fails to meet the density requirements or should the material lose the required stability, density or finish before the next course is placed or the project is accepted, the treated material shall be removed and replaced, unless otherwise approved by the Engineer or designated representative. Removal and replacement with acceptable treated material will be at the Contractor's expense. All initial density testing will be paid for by the City of Austin. All retesting shall be paid for by the Contractor.

G. Finishing

The resulting surface shall be "clipped", "skinned" or "tight bladed" by a maintainer or subgrade trimmer to a depth of approximately 1/4 inch (6 mm), removing all loosened materials. The loosened materials will be disposed of at the Contractor's expense and at a location approved by the Engineer or designated representative. The surface shall then be rolled with the pneumatic roller in accordance with Standard Specification Item No. 232S, adding small increments of moisture as needed during rolling. Throughout this operation, the shape of the course shall be maintained and the surface upon completion shall be smooth and in conformity with the typical sections, lines and grades as shown on the Drawings or as established by the Engineer or designated representative.

If plus No. 4 (4.75 mm) aggregate is present in the mixture, one complete coverage of the section with the flat wheel roller in accordance with Standard Specification Item No. 230S shall be made immediately after the "clipping" operation. When directed by the Engineer or designated representative, surface finishing methods may be varied from this procedure, provided a dense, uniform surface, free of surface compaction planes, is produced.

The moisture content of the surface material must be maintained within two (2) percentage points of optimum during all finishing operations. Surface compaction and finishing shall proceed in such a manner as to produce, in not more than 2 hours, a smooth, closely knit surface conforming to the crown, grade and line indicated which is free of cracks, ridges or loose material.

## 204S.7 Curing

A. Protection and Cover

After the cement treated course has been finished as specified herein, the surface shall be protected against rapid drying by either one of the following curing methods. The protection measures shall be continued: (a) for the specified period, but in no case less than 3 days, or (b) until the surface or subsequent courses are placed:

1. Maintain in a thorough and continuously moist condition by sprinkling.

2. Apply a 2 inch (50 mm) layer of earth on the completed course and maintain in a moist condition.

3. Apply an asphaltic material to the treated course at the rate of 0.05 to 0.20 gallon per square yard (0.25 to 0.90 liters per square meter), as determined by the Engineer or designated representative. The asphalt used shall be the type and grade shown on the Drawings or as approved by the Engineer or designated representative, in accordance with Standard Specification Item No. 301. The asphalt shall completely cover and seal the total surface of the base and fill all voids.

   If this method is used, it shall be the Contractor's responsibility to protect the asphalt membrane from being picked up by traffic by either sanding or dusting the membrane surface. The asphalt membrane may remain in place when the proposed surface or other base courses are placed.

B. Surface

The surface or other base courses may be applied on the finished base as soon after completion as operations will permit.

**204S.8 Construction Joints**

At the end of each day's construction, a straight transverse construction joint shall be formed by cutting back into the total width of completed work to form a vertical face free of loose and shattered material.

Cement treatment for large, wide areas shall be built in a series of parallel lanes of convenient length and width meeting the approval of the Engineer or designated representative.

**204S.9 Traffic**

Completed sections of cement treated material in place may be opened immediately to local traffic, construction equipment and all traffic after the curing period, provided the cement treated course has hardened sufficiently to prevent marring or distorting of the surface by equipment or traffic.

**204S.10 Maintenance**

The Contractor shall be required to maintain the cement treated course in good condition until all work has been completed and accepted. Maintenance shall include immediate repairs of any defects that may occur. This work shall be done by the Contractor at no additional cost to the Owner and shall be repeated as often as needed to keep the area continuously intact. Any improper, insufficient or faulty work shall be replaced to the full depth of treatment.

It is the intent of this specification that the Contractor construct the plan depth of cement treatment in one homogeneous mass. The addition of thin stabilized layers will not be permitted to provide the minimum specified depth.

**204S.11 Measurement**

"Portland Cement Treatment for Materials in Place" will be measured as follows:

Cement treatment for materials in place will be measured by the square yard (square meter: 1 square meter equals 1.196 square yards) of surface area of completed and accepted work.

Portland Cement, specified by the Engineer or designated representative for incorporation in the cement treatment, will be measured by the barrel of 376 pounds (170 kilograms) of cement.

**204S.12 Payment**

This item will be paid for at the contract unit bid price for "Portland Cement" and "Portland Cement Treatment of Materials in Place".

The unit bid prices shall each include full compensation for: (a) mix designs, (b) preparing the roadbed; (c) furnishing all material; (d) all freight charges involved; (e) furnishing scales and labor involved in weighing the material; (f) pulverizing; applying cement and water, (g) all processing, mixing, spreading, sprinkling, compacting, finishing and curing the cement treated soil; and (h) all manipulations, labor, equipment, fuels, tools and incidentals necessary to complete the work.

Payment will be made under one of the following:

| | | |
|---|---|---|
| **Pay Item No. 204S-A:** | Portland Cement Treatment of Materials in Place ___ inch thickness | Per Square Yard. |
| **Pay Item No. 204S-B:** | Portland Cement | Per Barrel. |

**End**

| ***SPECIFIC* CROSS REFERENCE MATERIALS** |
|---|
| **Item 204S, "PORTLAND CEMENT TREATMENT FOR MATERIALS IN PLACE"** |

City of Austin Standard Contract Documents

| Designation | Description |
|---|---|
| Section 00700 | General Conditions |

City of Austin Standard Specifications

| Designation | Description |
|---|---|
| Item No. 230S | Rolling (Flat Wheel) |
| Item No. 232S | Rolling (Pneumatic Tire) |
| Item No. 236S | Proof Rolling |
| Item No. 30S | Asphalts, Oils and Emulsions |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item No. 524 | Hydraulic Cement |

Texas Department of Transportation: Manual of Testing Procedures

| Designation | Description |
|---|---|
| Tex-103-E | Determination of Moisture Content of Soil Materials |
| Tex-115-E | Field Method for Determination of In-Place Density Soils & Base Materials |

| | |
|---|---|
| Tex-120-E | Soil Cement Testing |

American Association of Highway and Transportation Officials, Standard Specifications

| Designation | Description |
|---|---|
| T-26 | Quality of Water Used in Concrete |

| ***RELATED*** **CROSS REFERENCE MATERIALS** |
|---|
| **Item 204S, "PORTLAND CEMENT TREATMENT FOR MATERIALS IN PLACE"** |

City of Austin Standard Specification Items

| Designation | Description |
|---|---|
| Item No. 101S | Preparing Right of Way |
| Item No. 102S | Clearing and Grubbing |
| Item No. 104S | Removing Portland Cement Concrete |
| Item No. 110S | Street Excavation |
| Item No. 111S | Excavation |
| Item No. 130S | Borrow |
| Item No. 132S | Embankment |
| Item No. 202S | Hydrated Lime and Lime Slurry |
| Item No. 203S | Lime Treatment for Materials in Place |
| Item No. 210S | Flexible Base |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item No. 100 | Preparing Right of Way |
| Item No. 110 | Excavation |
| Item No. 112 | Subgrade Widening |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item No. 132 | Embankment |
| Item No. 150 | Blading |
| Item No. 158 | Specialized Excavation Work |
| Item No. 204 | Sprinkling |
| Item No. 210 | Rolling (Flat Wheel) |
| Item No. 211 | Rolling (Tamping) |
| Item No. 213 | Rolling (Pneumatic Tire) |
| Item No. 275 | Portland Cement Treated Materials (Road Mixed) |
| Item No. 276 | Portland Cement Treated Base (Plant Mixed) |
| Item No. 421 | Portland Cement Concrete |
| Item No. 522 | Portland Cement Concrete Plants |

Texas Department of Transportation: Manual of Testing Procedures

| Designation | Description |
|---|---|

| | |
|---|---|
| Tex-101-E | Surveying and Sampling Soils for Highways |
| Tex-104-E | Determination of Liquid Limit of Soils |
| Tex-105-E | Determination of Plastic limit of Soils |
| Tex-106-E | Method of Calculating the Plasticity Index of Soils |
| Tex-112-E | Methods of Admixing Lime to Reduce Plasticity Index of Soils |
| Tex-114-E | Laboratory Compaction Characteristics & Moisture Density Relationship of Subgrade & Embankment Soil |
| Tex-117-E | Triaxial Compression Tests for Disturbed Soils and Base Materials |

## 210S.1 Description

This item governs furnishing and placing a crushed stone base course for surfacing, pavement, or other base courses. “Flexible Base" shall be constructed on an approved, prepared surface in one or more courses conforming to the typical sections and to the lines and grades, indicated on the Drawings or established by the Engineer or designated representative.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

## 210S.2 Submittals

The submittal requirements of this specification item may include:

A. Source, gradation and test results for the crushed limestone material,

B. Notification that the crushed limestone stockpile is completed and ready for testing, and

C. Field density test results for in-place compacted flexible base,

## 210S.3 Material

A. Mineral Aggregate

The material shall be crushed argillaceous limestone meeting the requirements specified herein. The material shall be from sources approved by the City and shall consist of durable crushed stone that has been screened to the required gradation.

Flexible base materials shall be tested according to the following TxDoT standard test methods:

| | |
|---|---|
| a) Preparation for Soil Constants and Sieve Analysis | Tex-101-E |
| b) Liquid Limit | Tex-104-E |
| c) Plastic Limit[1] | Tex-105-E |
| d) Plasticity Index | Tex-106-E |
| e) Sieve Analysis | Tex-110-E |
| f) Wet Ball Mill[2] | Tex-116-E |
| g) Triaxial Test | Tex-117-E, Part II |

1. Plasticity Index shall be determined in accordance with Tex-107-E (Linear Shrinkage) when liquid limit is unattainable as defined in Tex-104-E.
2. When a soundness value is required on the drawings, the material shall be tested in accordance with Tex-411-A.

Base material shall be stockpiled after crushing, then tested by the City's designated laboratory and approved by the Engineer or designated representative prior to being hauled to the Project.

The material shall be well graded and shall meet the following requirements:

| Sieve Designation | | Other Requirements | % Retained | |
|---|---|---|---|---|
| US | SI | | | |
| 1 3/4" | 45 mm | | 0 | |
| 7/8" | 22.4 mm | | 10-35 | |
| 3/8" | 9.5 mm | | 30-50 | |
| #4 | 4.75 mm | | 45-65 | |
| #40 | 425 μm | | 70-85 | |
| | | Maximum Plasticity Index | | 10 |
| | | Maximum Wet Ball Mill | | 42 |
| Maximum Increase in passing #40 (425 μm) sieve from Wet Ball Mill Test | | | 20 | |

Minimum compressive strength when subjected to the triaxial test shall be 35 psi at 0 psi lateral pressure [240 kiloPascal (kPa) at 0 kPa lateral pressure] and 175 psi at 15 psi lateral pressure [1200 kiloPascal (kPa) at 100 kPa lateral pressure].

B. Asphaltic Material

Prime Coat. Prime Coat shall conform to the requirements of Standard Specification Item 306S, "Prime Coat", except for measurement and payment.

## 210S.4 Stockpiling, Storage and Management

A. Managing Material**:**

The stockpile shall be constructed on a relatively smooth area that has been cleared of debris, weeds, brush, trees and grass. Stockpiles shall contain between 25,000 and 50,000 cubic yards (19,100 to 38,200 cubic meters). The stockpile shall be constructed using scrapers, bottom dumps or other similar equipment that allows dumping and spreading without rehandling. The stockpile shall be constructed to allow dumping and spreading in one direction only. The height of the stockpile shall not exceed the capabilities of available equipment to make a full cut (bottom to top) on any of the four sides.

A stockpile shall be completed before being tested by the City. The Contractor’s supplier shall notify the City when a stockpile has been completed and is ready to be tested. The stockpile shall not be added to after it has been tested.

The Contractor shall provide material only from stockpiles that have been inspected, tested and accepted by the City. A ticket showing the date, source, stockpile number, and net weight (mass) shall be provided to the Inspector with each load of material delivered to the Project.

Material shall be loaded from the stockpile by making successive vertical cuts through its entire depth.

B. Test Sampling:

The Contractor's supplier may choose the method of sample gathering for testing by the City's laboratory as follows:

1. The supplier shall make a full-height cut a sufficient distance into each side of the stockpile to obtain a uniform sample. The four samples (one from each side of the stockpile) shall then be combined and mixed into a single "test" specimen from which the City's laboratory can obtain a sample.

2. As the stockpile is constructed, a perpendicular cut will be made across the spreading direction at every two feet to four feet (0.6 to 1.2 meters) of height and the sample used to start a "mini" stockpile. The process shall be repeated in two feet to four feet (0.6 to 1.2 meter) increments of height, until the stockpile and the "mini" stockpile are completed. Samples shall be obtained from the "mini" stockpile in the same manner described in (1) above.

C. Testing and Acceptance:

When initial tests indicate
that the material is unacceptable, the City may, if requested by the Contractor's supplier, sample and test the material one more time. The additional sampling and testing shall be paid for by the supplier.

### *210S.5 Construction Methods*

A. Preparation of Subgrade:

Flexible base shall not be placed until the Contractor has verified by proof rolling that the subgrade has been prepared and compacted in conformity with Standard Specification Item 201S, "Subgrade Preparation," to the typical sections, lines and grades indicated on the Drawings. Any deviation shall be corrected and proof rolled prior to placement of the flexible base material.

The Contractor shall not place flexible base until the subgrade has cured to the satisfaction of the Engineer or designated representative, regardless of whether or not the subgrade has been successfully proof rolled. As a minimum, this will be after the surface displays no damp spots and there is no evidence of "sponginess" in the subgrade.

B. First Lift:

Immediately before placing the flexible base material, the subgrade shall be checked for conformity with grade and section. The thickness of each lift of flexible base shall be equal increments of the total base depth. No single lift shall be more than six inches (150 mm) or less than three inches (75 mm) compacted thickness.

The material shall be delivered in approved vehicles. It shall be the responsibility of the Contractor to deliver the required amount of material. If it becomes evident that insufficient material was placed, additional material as

necessary shall be delivered and the entire course scarified, mixed and compacted.

Material deposited upon the subgrade shall be spread and shaped the same day unless otherwise approved by the Engineer or designated representative. In the event inclement weather or other unforeseen circumstances render spreading of the material impractical, the material shall be spread as soon as conditions allow.

Additionally, if the material cannot be spread and worked the same day it is deposited, the Contractor shall "close up" the dump piles before leaving the job site. “Closed up” shall be defined as the use of a motor grader to blade all dump piles together, leaving no open space between piles.

The material shall be spread, sprinkled, if required, then thoroughly mixed; bladed, dragged and shaped to conform to the typical sections indicated on the Drawings.

All areas and "nests" of segregated coarse or fine material shall be corrected or removed and replaced with well-graded material.

Each lift shall be sprinkled as required to bring the material to optimum moisture content, then compacted to the extent necessary to provide not less than the percent density specified in Section 210S.5.D, "Density." In addition to the requirements specified for density, the full depth of flexible base material shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section of flexible base material is completed, tests, as necessary, will be made by the Engineer or designated representative. As a minimum, three in-place density tests per section per day will be taken. If the material fails to meet the density requirements, it shall be reworked as necessary to meet these requirements. All initial testing will be paid for by the City. All retesting shall be paid for by the Contractor.

Throughout the entire operation, the surface of the material shall be maintained by blading and, upon completion, shall be smooth and shall conform to the typical section indicated on the Drawings and to the established lines and grades.

In that area on which pavement is to be placed, any deviation in excess of 1/4 inch (6.5 mm) in cross section or 1/4 inch in a length of 16 feet (6.5 mm in a length of 5 meters) measured longitudinally shall be corrected by loosening, adding or removing material, and by reshaping and recompacting. All irregularities, depressions or weak spots shall be corrected immediately by scarifying the areas affected, adding suitable material as required, and by reshaping and recompacting. Should the lift, due to any reason or cause, lose the required stability, density and/or finish before the surfacing is complete, it shall be recompacted and refinished at the Contractor's expense.

C. Succeeding Lifts:

Construction methods for succeeding lifts shall be the same as prescribed for the first lift. For that lift of the flexible base upon which the curb and gutter will be constructed, as well as the last flexible base lift (i.e. top of the flexible base), the Contractor shall check the surface of the lift for conformity to the lines and grades by setting "blue tops" at intervals not exceeding 50 feet (15 meters) on

the centerline, at quarterpoints, at curb lines or edge of pavement, and at other points that may be indicated on the Drawings.

When the thickness of a particular lift of the flexible base is in question, the Contractor shall check the surface of the lift for conformity to the lines and grades by setting "blue tops" at intervals not exceeding 50 feet (15 meters) on the centerline, at quarter points, at curb lines or edge of pavement, and at other points that may be indicated on the Drawings

D. Density:

The flexible base shall be compacted to not less than 100 percent density as determined by TxDoT Test Method Tex-113-E.

Field density determination shall be made in accordance with TxDoT Test Method Tex-115-E unless otherwise approved by the Engineer or designated representative. Each lift of the flexible base shall also be tested by proof rolling in conformity with Standard Specification Item 236S “Proof Rolling.”

E. Priming:

After the flexible base material has been compacted to not less than 100 percent density, and tested by proof rolling, a prime coat will be applied in accordance with Standard Specification Item 306S, "Prime Coat."

F. Curing:

Pavement materials, such as a tack coat or surface course, shall not be placed on the primed surface until the prime coat has been absorbed into the base course. At least 24 hours, or longer if designated by the Engineer or designated representative, shall be allowed when cutback asphalt is used as the prime coat.

## 210S.6 Measurement

"Flexible Base" will be measured by the cubic yard (cubic meter: 1 cubic meter equals 1.196 cubic yards), complete in place, as indicated in the Contract Documents.

## 210S.7 Payment

This item will be paid for at the contract unit bid price for "Flexible Base". The unit bid price shall include full compensation for all work specified herein, including the furnishing, hauling, placing and compacting of all materials; for rolling, proof rolling, recompacting and refinishing; for all water required; for retesting as necessary; for priming; and for all equipment, tools, labor and incidentals necessary to complete the Work.

Prime coat will not be measured and paid for directly but shall be included in the unit price bid for Standard Specification Item 210S, "Flexible Base.”

Payment will be made under one of the following:

**Pay Item No. 210S-A:** Flexible Base Per Cubic Yard.

**End**

## ***SPECIFIC*** CROSS REFERENCE MATERIALS

City of Austin Standard Specifications

| Designation | Description |
|---|---|
| Item No. 201S | Subgrade Preparation |
| Item No. 236S | Proof Rolling |
| Item No. 306S | Prime Coat |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Tex-101-E | Preparation of Soil and Flexible Base Materials for Testing |
| Tex-104-E | Determination of Liquid Limit of Soils |
| Tex-105-E | Determination of Plastic Limit of Soils |
| Tex-106-E | Method of Calculating the Plasticity Index of Soils |
| Tex-107-A | Determination of Bar Linear Shrinkage of Soils |
| Tex-110-E | Determination of Particle Size Analysis of Soils |
| Tex-113-E | Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials and Cohesionless Sands |
| Tex-115-E | Field Method for Determination of In-Place Density of Soils and Base Materials |
| Tex-116-E | Ball Mill Method for Determination of the Disintegration of Flexible Base Material |
| Tex-117-E | Triaxial Compression Tests for Disturbed Soils and Base Materials |
| Tex-411-A | Soundness of Aggregate By Use Of Sodium Sulfate Or Magnesium Sulfate |

## ***RELATED*** CROSS REFERENCE MATERIALS

City of Austin Standard Details

| Designation | Description |
|---|---|
| No. 1000S-2 | Flexible Base with Asphalt Surface Trench Repair-Existing Pavement |
| No. 510S-3 | Typical Trench with Paved Surface |
| No. 1000S | Bus Stop Paving |
| No. 1000S-10 | Local Street Sections |
| No. 1000S-11(1) | Residential and City of Austin Neighborhood Collector Street Sections |
| No. 1000S-11(2) | Industrial and Commercial Collector Street Sections |
| No. 1000S-12(1) | Primary Collector Street Sections |
| No. 1000S-12(2) | Primary Arterial Street Sections |
| No. 1000S-13(1) | Minor Arterial Street Sections (4 Lanes) |
| No. 1000S-13(2) | Minor Arterial Street Sections-(4 Lanes divided) |
| No. 1000S-14 | Major Arterial Street Sections |

City of Austin Utility Criteria Manual

| Designation | Description |
|---|---|
| Section 5.8.2 | Flexible Base |
| Section 5.7.3 | Flexible Base with Asphalt Surface |
| Section 5.9.1 | Excavation in Alley |

City of Austin Transportation Criteria Manual

| Designation | Description |
|---|---|
| Section 3.2.0 | General Criteria |
| Section 3.4.3 .D | Layer Data-Minimum Thickness |
| Table 3-1 | Minimum Layer Thickness |
| Section 3.4.3 .F | Layer Data- Minimum Thickness |
| Table 3-2 | Layer Thickness Increment |
| Section 3.4.3 .J | Layer Data- Stiffness Coefficient |
| Table 3-3 | Stiffness Coefficient |
| Table 3-9 | Recommended Salvage values |
| Table 3-10 | AASHTO Layer Coefficients |

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**Item No. 236S**
**Proof Rolling**

## 236S.1 Description

This item shall govern furnishing and operating heavy pneumatic tired compaction equipment for locating unstable areas of embankment, subgrade and flexible base courses.

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.

## 236S.2 Submittals

The submittal requirements of this specification item may include:

A. A plan describing the condition of each roller proposed for the work, as well as the type of traction (self propelled or drawn), Type of roller, size, weight, tire pressure (if appropriate) and configuration of each individual roller, and

B. The operating speed proposed for each individual roller.

## 236S.3 Equipment

A. Standard Proof Roller:

The proof rolling equipment shall have a loading platform or body suitable for ballast loading that is supported on a minimum of two (2) axles with not more than two (2) pneumatic tired wheels per axle. All wheels shall be arranged so that they will carry approximately equal loads when operating on uneven surfaces. Pneumatic proof rolling equipment with multiple pivotal axles and more than two tires along the front or rear axle axis shall have articulating axle supports to equally distribute the load to all tires over uneven surfaces.

The proof roller unit, under working conditions, shall have a minimum contact width of 7-1/2 feet (2.3 meters) and shall be so designed that the gross roller weight may be varied uniformly from 25 tons to 50 tons (23 megagrams to 45 megagrams) by ballast loading. The tires shall be capable of operating under various loads with variable air pressures up to 145 psi (up to 1000 kiloPascals). The tires shall be smooth tread and shall impart a minimum ground contact pressure of 75 pounds per square inch (520 kiloPascals). Tires shall be practically full of liquid (i.e. when liquid will flow from the valve stem of a fully inflated tire with the stem in the uppermost position). The operating load and tire pressure shall be within the range of the manufacturer's chart as directed by the Engineer or designated representative.

The proof roller shall be drawn by a power train of adequate tractive effort or may be of a self-propelled type. The proof rolling equipment shall be equipped with a reverse mode transmission or be capable of turning 180 degrees in the street width. When a separate power train is used to draw the proof roller, the power train weight shall not be considered in the weight of the proof roller. The power train shall be rubber-tired when rolling subgrade and base materials. A cleated or track-type power train may be used on earth and rock embankments.

B. Alternate Equipment:

With the written approval of the Engineer or designated representative, the Contractor may utilize alternate equipment on embankment courses, subgrade and base courses subject to the requirements of the standard proof roller except with respect to minimum contact width, axle/tire arrangement and tire tread.

Alternate equipment for stability testing of embankments shall be restricted to equipment that can be shown to impart a stress distribution on the embankment structure equivalent to or greater than the stress induced by the concentrated weight of a standard proof roller.

C. Equipment Submittals:

All standard proof rollers and proposed alternate equipment must be approved by the Engineer or designated representative prior to their use. The Contractor shall furnish the Engineer or designated representative with charts or tabulations showing the contact areas and contact pressures for the full range of tire inflation pressures and for the full range of loadings for the particular tires furnished.

Alternate equipment submittals for proof rolling of embankments shall be signed and sealed by a registered Professional Engineer licensed in the State of Texas.

## 236S.4 Construction Methods

A. General:

Within the ranges set forth in Section 236S.3, the load and tire inflation pressures shall be adjusted as directed by the Engineer or designated representative. It is proposed to use a contact pressure corresponding as nearly as practical to the maximum supporting value of the earthwork or base. The entirety of prepared surfaces to be tested by this method shall be proof rolled by a minimum of two passes of the proof roller tires. Each succeeding trip of the proof roller shall be offset by not greater than one tire width.

When alternate equipment is proposed and only one axle meets minimum requirements, only the qualifying axle shall be used to proof roll. If the operation of the proof roller shows an area to be unstable, the substandard area shall be brought to satisfactory stability and uniformity by additional curing, compaction, or by removal and replacement of unsuitable materials. The re-worked area shall then be proof rolled.

Proof rollers shall be operated at speeds between 2 and 6 miles per hour (3 and 10 kilometers per hour) or as directed by the Engineer or designated representative.

Acceptable limits of elastic and plastic deformation of prepared subgrade courses shall be established by proof rolling Test Sections of representative soil conditions, previously tested and approved for density and moisture requirements of the governing subgrade and earth embankment items. Proof rolling of first course base over a plastic subgrade may be waived by the Engineer or designated representative if it is determined that the prepared first course base will be damaged by the proof roller.

B. Roadway Construction:

The subgrade and all lifts of base material shall be proof rolled in new roadway construction and in the reconstruction of existing streets. Proof rolling of the curb course base shall be substituted for proof rolling of final course base at the direction of the Engineer or designated representative. Proof rolling may be waived by the Engineer or designated representative where construction is limited to turn lanes, street widening less than 7-1/2 feet (2.3 meters) in width, or where the site is otherwise congested.

C. Trenches:

Trenches shall be proof rolled where no limitations to the operation of the proof roller exist as may be determined by the Engineer subject to the provisions hereunder.

All trenches shall be proof rolled in new roadways or in existing roadways under reconstruction. Trenches shall be proof rolled at the street subgrade elevation by longitudinal and perpendicular passes of the roller as may be dictated by the width of the trench.

Proof rolling of trenches in existing paved streets shall be limited to pavement cross-sections capable of sustaining the weight of the proof rolling equipment without imparting damage to the remaining pavement structure as determined by the Engineer. Trenches less than 4 feet (1.2 meters) in width shall be exempted of all proof rolling requirements. Only the final course base shall be proof rolled in trenches 4 feet (1.2 meters) or wider but narrower than the proof roller contact width. The subgrade, the first course and the final course base shall be proof rolled in trenches 7-1/2 feet (2.3 meters) or wider.

D. Embankment Construction:

All embankment courses shall be proof rolled, unless otherwise directed by the Engineer or designated representative.

If required by the Engineer or designated representative, stability testing of embankments constructed to the finished cross-section and elevation or to interim elevations shall either be conducted with a standard proof roller or alternate equipment, which can be proven to impart a horizontal and vertical pressure distributions equivalent to or greater than those induced by a standard proof roller.

## 236S.5 Measurement and Payment

No direct payment will be made for the materials, equipment or labor required by this item, but shall be included in the unit price bid for the item of construction in which this item is used.

**End**

| ***RELATED*** CROSS REFERENCE MATERIALS |
|---|
| Specification Item 236S, “Proof Rolling” |

City of Austin Contract Documents

| Designation | Description |
|---|---|
| Section 00700 | General Conditions |

City of Austin Standard Specifications

| Designation | Description |
|---|---|
| Item No. 101S | Preparing Right of Way |
| Item No. 102S | Clearing and Grubbing |
| Item No. 110S | Street Excavation |
| Item No. 111S | Excavation |
| Item No. 130S | Borrow |
| Item No. 132S | Embankment |

| ***RELATED*** CROSS REFERENCE MATERIALS-Continued |
|---|
| Specification 236S, “Proof Rolling” |

City of Austin Standard Specifications

| Designation | Description |
|---|---|
| Item No. 201S | Subgrade Preparation |
| Item No. 202S | Hydrated Lime and Lime Slurry |
| Item No. 203S | Lime Treatment for Materials in Place |
| Item No. 204S | Portland Cement Treatment For Materials in Place |
| Item No. 206S | Asphalt Stabilized Base (Plant Mix) |
| Item No. 210S | Flexible Base |
| Item No. 230S | Rolling (Flat Wheel) |
| Item No. 232S | Rolling (Pneumatic Tire) |
| Item No. 234S | Rolling (Tamping) |
| Item No. 301S | Asphalts, Oils and Emulsions |
| Item No. 306S | Prime Coat |
| Item No. 307S | Tack Coat |
| Item No. 310S | Emulsified Asphalt Treatment |
| Item No. 320S | Two Course Surface Treatment |
| Item No. 340S | Hot Mix Asphaltic Concrete Pavement |
| Item No. 402S | Controlled Low Strength Material |
| Item No. 403S | Concrete for Structures |

City of Austin Standard Details

| Designation | Description |
|---|---|
| No. 1000S-10 | Local Street Sections |
| No. 1000S-11(1) | Residential and City of Austin Neighborhood Collector Street Sections |
| No. 1000S-11(2) | Industrial and Commercial Collector Street Sections |
| No. 1000S-12(1) | Primary Collector Street Sections |
| No. 1000S-12(2) | Primary Arterial Street Sections |
| No. 1000S-13(1) | Minor Arterial Street Sections (4 Lanes) |
| No.1000S-13 (2) | Minor Arterial Street Sections- (4 Lanes divided) |
| No. 1000S-14 | Major Arterial Street Sections |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item No. 100 | Preparing Right of Way |
| Item No. 110 | Excavation |
| Item No. 112 | Subgrade Widening |
| Item No. 132 | Embankment |
| Item No. 150 | Blading |
| Item No. 158 | Specialized Excavation Work |
| Item No. 204 | Sprinkling |
| Item No. 210 | Rolling (Flat Wheel) |
| Item No. 211 | Rolling (Tamping) |
| Item No. 213 | Rolling (Pneumatic Tire) |
| Item No. 264 | Lime and Lime Slurry |
| Item No. 300 | Asphalts, Oils and Emulsions |
| Item No. 301 | Asphalt Anti-stripping Agents |
| Item No. 310 | Prime Coat (Cutback Asphaltic Materials) |
| Item No. 314 | Emulsified Asphalt Treatment |
| Item No. 316 | Surface Treatments |
| Item No. 345 | Asphalt Stabilized Base (Plant Mixed) |

| ***RELATED*** CROSS REFERENCE MATERIALS-Continued |
|---|
| Specification 236S, “Proof Rolling” |

Texas Department of Transportation: Manual of Testing Procedures

| Designation | Description |
|---|---|
| Tex-101-E | Surveying and Sampling Soils for Highways |
| Tex-103-E | Determination of Moisture Content of Soil Materials |
| Tex-104-E | Determination of Liquid Limit of Soils |
| Tex-105-E | Determination of Plastic limit of Soils |
| Tex-106-E | Method of Calculating the Plasticity Index of Soils |
| Tex-114-E | Laboratory Compaction Characteristics & Moisture Density Relationship of Subgrade & Embankment Soil |
| Tex-115-E | Field Method for Determination of In-Place Density of Soils & Base Materials |
| Tex-117-E | Triaxial Compression Tests for Disturbed Soil and Base Materials |
| Tex-120-E | Soil Cement Testing |
| Tex-121-E | Soil Lime Testing |
| Tex-126-E | Molding, Testing and Evaluation of Bituminous Black Base Materials |
| Tex-207-F | Determination of Density of Compacted Bituminous Mixtures |
| Tex-210-F | Determination of Asphalt Content of Bituminous Mixtures |
| Tex-600-J | Sampling and Testing of Hydrated Lime, Quicklime & Commercial Lime Slurry |

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**Item No. 360S**
**Concrete Pavement**

## 360S.1 Description

This item shall consist of a pavement and/or base of Portland Cement concrete, with or without reinforcement as indicated on the Drawings, with or without monolithic curbs, constructed as herein specified, on prepared subgrade or base course in conformity with the thickness and typical cross sections indicated on the Drawings. Concrete to be considered of satisfactory quality provided it is made (a) of materials accepted for job, (b) in the proportions established by the Contractor and (c) mixed, placed, finished and cured in accordance with the requirements of this specification.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

## 360S.2 Submittals

The submittal requirements of this specification item may include:

Mix design option(s) of the class of concrete required on the project,

The supplier of the concrete mix design(s) and type of mixing equipment, and

Type of admixtures to be used with the concrete mixes.

## 360S.3 Materials

A. Cementatious Materials

Portland cement shall conform to ASTM C 150, Type I (General Purpose) and Type III (High Early Strength). Type III cement shall be used when high early strength concrete is indicated on the Drawings. If the use of high early cement is not specified and the Contractor desires to use it, the Contractor shall obtain written permission from the Engineer or designated representative prior to its use and shall assume all additional costs incurred by the use of such cement. All cement shall be of the same type and from the same source for a project unless written permission if first received from the Engineer or designated representative.

Portland cement manufactured in a cement kiln fueled by hazardous waste shall be considered as an approved product if the production facility is authorized to operate under regulation of the Texas Commission on Environmental Quality (TCEQ) and the United States Environmental Protection Agency (USEPA). Supplier shall provide current TCEQ and EPA authorizations to operate the facility.

Bulk or sacked cement may be used and a bag shall contain 94 pounds (42.6 KG) net. All bags shall be in good condition at the time of inspection. Bulk cement shall be weighed on approved scales as herein prescribed.

All cement shall be stored in a suitable weather tight building or bin, which will protect the cement from dampness. The cement shall be so stored as to provide easy access for proper inspection. Any cement, which has become partially set or which contains hard lumps or cakes or cement salvaged from discarded or used bags, shall not be used.

Fly ash (denoted by Texas DOT designations Type A and Type B) may replace 20 to 35 percent of a mix design's Portland cement content by absolute volume. Fly ash shall not be used in mix designs with less that five (5) sacks of Portland cement per cubic yard [six and a half (6.5) sacks of Portland cement per cubic meter] unless specifically permitted by the Contract plans of project manual. Fly ash shall conform to the requirements of Item 405S, "Concrete Admixtures".

B. Admixtures

Concrete admixtures conforming to Item No. 405S, "Concrete Admixtures" may be used when approved by the Engineer or designated representative to minimize segregation, improve workability, reduce the amount of mixing water and to provide normal hot weather concreting provisions. The use of admixtures shall not alter the approved mix designs, except for water content.

C. Coarse Aggregate

Coarse aggregate shall consist of durable particles of gravel, crushed blast furnace slag and/or crushed stone of reasonably uniform quality throughout, free from injurious amounts of salt, alkali, vegetable matter or other objectionable material, either free or as an adherent coating on the aggregate. It shall not contain more than 0.25 percent by weight of clay lumps nor more than 1.0 percent by weight of shale nor more than 5.0 percent by weight of laminated and/or friable particles when tested in accordance with TxDOT Test Method Tex-413-A.

Coarse aggregate shall have a wear of not more than 45 percent when tested according to TxDOT Test Method Tex-410-A and when tested by standard laboratory methods shall meet the following grading requirements:

| | |
|---|---|
| Retained on 1 3/4 inch (43.75 mm) sieve | 0% |
| Retained on 1 1/2 inch (37.5 mm) sieve | 0 to 5% |
| Retained on 3/4 inch (19.0 mm )sieve | 30 to 65% |
| Retained on 3/8 inch (9.5 mm) sieve | 70 to 90% |
| Retained on No. 4 (4.75 mm) sieve | 95 to 100% |

Loss by Decantation TxDOT Test Method *Tex-406-A. 1.0% Maximum

* In the case of aggregate made primarily from crushing of stone. If the material finer than the 200 sieve is definitely established to be the dust of fracture

essentially free from clay or shale as established by Part III of TxDOT Test Method Tex-406-A, the percent may be increased to 1.5.

When the plans do not require a monolithic pour of curb or curb and gutter, the Contractor may elect to use the following gradation of coarse aggregate for curb or curb and gutter:

| | |
|---|---|
| Retained on 1 1/2 inch (37.5 mm) sieve | 0% |
| Retained on 3/8 inch (9.5 mm) sieve | 5 to 30% |
| Retained on No. 4 (4.75 mm) sieve | 75 to 100% |

Where the coarse aggregate is delivered on the job in 2 or more sizes or types, each type and/or size shall be batched and weighed separately.

All aggregates shall be handled and stored in such a manner as to prevent size segregation and contamination by foreign substances and maintain as nearly as possible in a uniform condition of moisture. When segregation is apparent, the aggregate shall be remixed with suitable equipment as required. At time of its use, the aggregate shall be free from frozen material and aggregate containing foreign materials will be rejected. Coarse aggregate that contains more than 0.5 percent free moisture by weight shall be stockpiled for at least 24 hours prior to use.

Adequate storage facilities shall be provided for approved materials. The intermixing of non-approved materials with approved materials either in stockpiles or in bins will not be permitted. Aggregates from different sources shall be stored in different stockpiles unless otherwise approved by the Engineer or designated representative.

D. Fine Aggregate

Fine aggregate shall be free from injurious materials of salt, alkali or vegetable matter. It shall not contain more than 0.5 percent by weight of clay lumps. When subjected to the color test for organic impurities, TxDOT Test Method Tex-408-A, the fine aggregate shall not show a color darker than standard.

Unless shown otherwise on the drawings, fine aggregate shall have an acid insoluble residue of at least 60% by weight when tested in accordance with Tex 612-J.

Unless specified otherwise, fine aggregate shall meet the following grading requirements:

| | |
|---|---|
| Retained on 3/8 inch (9.5 mm) sieve | 0% |
| Retained on No. 4 (4.75 mm) sieve | 0 to 5% |

| | |
|---|---|
| Retained on No. 8 (2.36 mm) sieve | 0 to 20% |
| Retained on No. 16 (1.185 mm) sieve | 15 to 30% |
| Retained on No. 30 (600 µm) sieve | 35 to 75% |
| Retained on No. 50 (300 µm) sieve | 70 to 90% |
| Retained on No. 100 (150 µm) sieve | 90 to 100% |
| Retained on No. 200 (75 µm) sieve | 97 to 100% |

Fine aggregate will be subjected to the Sand Equivalent Test, TxDOT Test Method Tex-203-F. The sand equivalent value shall not be less than 80.

E. Mineral Filler

Mineral filler shall consist of clean stone dust, crushed sand, crushed shell or other approved inert material. It shall meet the following requirements when tested in accordance with TxDOT Test Method Tex-401-A:

| | |
|---|---|
| Retained on No. 30 (600 µm) sieve | 0% |
| Retained on No. 200 (75 µm) sieve | 0 to 35% |

Where fine aggregate is delivered to the job in 2 or more sizes or types, each type and/or size of material shall be batched and weighed separately. Where mineral filler is used, it shall be batched and weighed separately. At the time of its use the fine aggregate shall be free from frozen material and aggregate containing foreign material will be rejected.

All fine aggregate shall be stockpiled for at least 24 hours prior to use.

F. Mixing Water

Water for use in concrete and for curing shall be free from oils, acids, organic matter or other deleterious substances and shall not contain more than 1,000 parts per million of chlorides as Cl nor more than 1,000 parts per million of sulfates as SO4.

Water from municipal supplies approved by the State Health Department will not require testing. Contractor shall sample and test water from other sources and submit test results to the Engineer or designated representative for approval 10 days prior to proposed use.

Tests shall be made in accordance with "Standard Method of Test for Quality of Water to be used in Concrete", AASHTO Method T-26.

G. Transit-mixed Concrete

The use of transit-mixed (ready-mixed) concrete will be permitted by the Engineer or designated representative provided the batching plant and mixer trucks meet requirements of quality specified herein.

When ready-mixed concrete is used, additional mortar (1 sack cement, 3 parts sand and sufficient water) shall be added to each batch to coat the drum of the mixer or agitator truck. Delivery of concrete to the site of the work and its discharge from the truck mixer, agitator or non-agitating equipment shall be in accordance with the requirements of Item No. 410S, "Concrete Structures".

Ready-mixed concrete, batching plant and mixer truck operation shall include the following:

1) A ticket system will be used that includes a copy for the construction inspector. The ticket will have machine stamped time/date of the concrete batch, weight of cement, sand and aggregates; exact nomenclature and written quantities of admixtures and water. Any item missing or incomplete on the ticket may be cause for rejection of the concrete.

2) Sufficient trucks will be available to support continuous slab placements. The Contractor will satisfy the Engineer or designated representative that adequate standby trucks are available to support monolithic placement requirements.

3) A portion of the mixing water, required by the batch design to produce the specified slump, may be withheld and added at the job site but only with the permission of the Engineer or designated representative and under the Inspector's observation. When water is added under these conditions, it will be thoroughly mixed before any slump or strength samples are taken.

H. Joint Sealer

Unless otherwise shown on the plans, joint sealant for concrete pavement used on airport runways and/or taxiways shall be TxDOT Class 5. All other joint sealant shall be TxDOT Class 2.

As a minimum, the joint sealant shall comply with the following. The manufacturer of the joint sealant shall furnish certification that the product to be supplied meets or exceeds the specification.

1) Class 2 (Hot Poured Rubber-Asphalt). This sealer shall conform to Standard Specification Item No. 313S, “Cleaning and/or Sealing Joints and Cracks (Asphaltic Concrete)The sealer must be compatible with asphaltic concrete.

2) Class 5 (Low Modulus Silicone Sealant for Concrete Pavement). This material shall conform to Item 413S, “Cleaning and/or Sealing Joints and Cracks (PCC) and shall be furnished in a one-part silicone formulation, which does not require a primer for bond to concrete. A backer rod shall be

required which will be compatible with the sealant. No bond or reaction shall occur between the rod and sealant. The sealant shall adhere to the sides of the concrete joint. It shall not crack or break when exposed to temperatures below 32°F (0°C).

The sealant material shall have the following properties:

| | |
|---|---|
| Color | Gray |
| Flow, MIL-2-8802D, Sec 4.8.4, max | 0.2 |
| Working time, minutes | 10 |
| Tack-free time at 77$^{o}$ F +/- 2 o F (25$^{o}$C +/- 1.1$^{o}$C), MIL-2-8802D, | |
| Sec 4.8.7, minutes | 60 |
| Cure time at 77°F (25oC), days | 7-14 |
| Full Adhesion, days | 14-21 |

As Cured - after 7 days at 77$^{o}$F (25$^{o}$C), and 40% Relative Humidity

| | |
|---|---|
| Elongation, minimum percent | 1200 |
| Durometer Hardness, Shore A, ASTM D 2240, min | 15 |
| Joint movement capability, percent | +100/-50 |
| Tensile Strength, maximum elongation, percent | 100 |
| Peal strength, psi | 25 (172 kPa) |

I. Backer Rod

Backer Rod shall be expanded closed cell polyethylene foam compatible with sealant. No bond or reaction shall occur between rod and sealant. Backer Rod shall be of sufficient width to be in compression after placement.

J. Joint Filler

Boards for expansion joint filler and for contraction and longitudinal joints shall be of the size, shape and type indicated.

Board shall be obtained from Redwood, Cypress, Gum, Southern Yellow Pine or Douglas Fir timber. They shall be solid heartwood and shall be free from sapwood, knots, clustered birdseye, checks and splits. Occasional sound or hollow birdseye, when not in clusters, will be permitted provided the board is free from any other defects that will impair its usefulness as a joint filler. With the exception of Redwood and Cypress, all boards shall have a creosote or pentachlorophenol treatment of 6 pounds per cubic foot (96 kg/m3). When oven dried at 230°F (110oC) to a constant weight, the weight of the board per cubic foot (minus treatment), shall not be less than 20 pounds nor more than 35 pounds (not less than 320 nor more than 561 kgs per cubic meter).

K. Asphalt Board

Asphalt board when used as indicated shall be of required size, full depth of concrete placement and uniform thickness. When used in transverse joints, it shall conform approximately to shape of the pavement crown as indicated. Asphalt board shall consist of 2 liners of 0.016-inch (0.4 mm) asphalt impregnated paper filled with a mastic mixture of asphalt and vegetable fiber and/or mineral filler. Boards shall be smooth, flat and straight throughout and shall be sufficiently rigid to permit easy installation. Boards that crack or shatter during installing and finishing operations will not be acceptable. Board shall be furnished in lengths equal to 1/2 the pavement width or in lengths equal to the width between longitudinal joints and may be furnished in strips or scored sheets of the required shape. When tested in accordance with TxDOT Test Method Tex-524-C the asphalt boards shall not deflect from the horizontal more than 3/4 inch in 3 1/2 inches (19.3 cm in 90 cm). The asphalt board shall be placed such that they will not interfere with the bonding of the joint sealer.

L. Load Transmission Devices for Expansion and Contraction Joints

Approved load transmission devices, when indicated, shall meet the requirements specified herein:

Smooth steel bar dowels, used when indicated, shall be of the size and type indicated and shall be open-hearth, basic oxygen or electric-furnace steel conforming to the properties specified for grade 60 in ASTM A 615. The free end of dowel bars shall be smooth and free of shearing burrs.

When indicated, one end of each dowel bar shall be encased in an approved cap having an inside diameter of 1/16 inch (16 mm) greater than the diameter of the dowel bar. The cap shall be of such strength, durability and design as to provide free movement of the dowel bar and shall be approved by the Engineer or designated representative prior to use. One end of the cap shall be filled with a soft felt plug or shall be void in order to permit free movement of the dowel bar for a distance equivalent to 150 percent of the width of the expansion joint used. The dowel caps and dowel bars shall be held securely in place by bar ties as indicated on the drawings. Mechanical methods of implanting dowel bars in the plastic concrete may be used when approved by the Engineer or designated representative.

Where required, dowel bars shall be coated with a plastic material meeting the requirements indicated.

Where red lead and oil bar coating is indicated, the red lead may be of any standard commercial grade and the oil shall be clean and no lighter than Standard No. 30 SAE grade. Approved thinner and dryer may be added to the red lead, but the material upon application shall be of such consistency that will provide a uniform and heavy coating on the bar. Where asphalt bar coating is indicated, the material may be any standard grade of oil asphalt and shall be applied hot. Cutback asphalt will not be permitted for bar coating.

M. Metal Installing Devices for Joint Assembly

Metal installing devices for expansion and contraction joint assemblies (such as welded wire bar chairs, bar stakes and marker channels, channel caps, etc.) shall be as indicated or may be similar devices of equivalent or greater strength, approved by the Engineer or designated representative, that will secure joint assembly in correct position during the placing and finishing of concrete. Load transmission devices used in joint assemblies shall be secured in position by a transverse metal brace of the type and design indicated or may be secured in position by other approved devices of equivalent or greater strength that will provide positive mechanical connection between the brace and each unit (or than by wire tie) and prevent transverse movement of each load transmission device.

N. Steel Reinforcement

Steel reinforcing bars as required including tie bars shall be open-hearth, basic oxygen or electric-furnace new billet steel of Grade 60 or Grade 40 for concrete reinforcement as indicated. Bars that require bending shall be Grade 40 conforming to the requirements of ASTM A 615.

High yield reinforcing steel shall be either (a) open-hearth, basic oxygen or electric-furnace new billet steel conforming to ASTM A 615 Grade 60 or (b) rail steel bars for concrete reinforcement, conforming to ASTM A 616 Grade 60. Bars produced by piling method will not be accepted. High yield reinforcing steel bars shall be further identified by a special marking rolled into each bar. All reinforcing steel shall be deformed bars conforming to the requirements of pertinent ASTM Specifications.

Where prefabricated deformed wire mats are indicated or permitted, the wire shall be cold worked deformed steel wire conforming to the requirements of ASTM A 496, except that steel shall be made by open-hearth, electric-furnace or basic oxygen processes. The prefabricated deformed wire mats shall conform to the requirements of ASTM A 497, except that wires used shall be deformed and transverse wires shall project beyond the centerline of each edge longitudinal wire as indicated. Mats that have been bent or wires dislocated or parted during shipping or project handling shall be realigned to within 1/2 inch (13 mm) of original horizontal plane of the mat. Mats with any portion of the wires out of vertical alignment more than 1/2 inch (13 mm) after realignment and/or wires dislocated or mutilated so that, in the opinion of the Engineer, they do not represent the original mat, shall be rejected. The reinforcement may be clamped or wired so that the reinforcement will retain the horizontal and vertical alignment as indicated or as approved by the Engineer or designated representative. Deformed wire may be

used for tie bars and load transfer bars that require bending. The nominal size, area and theoretical weight of reinforcing steel wires covered by this provision are as listed in Table II. When fabricated steel bars or rod mats are indicated, the mats shall meet requirements of ASTM A 184.

Steel wire fabric reinforcement shall be of the gage and spacing indicated and shall conform to the requirements of ASTM A 82. Longitudinal and transverse wires shall be electrically welded together at all points of intersection and the welds shall be of sufficient strength that they will not be broken during handling or placing. All welding and fabrication of fabric sheets shall conform to the requirements of ASTM A 185. Welded steel wire fabric shall be furnished in sheets as indicated and steel having been previously bundled into rolls will not be accepted. An approved hinge will be permitted in each sheet to provide for each sheet longitudinally. When wire fabric is used, it will replace only the longitudinal and transverse bars. The tie bars and load transmission units at joints will not be affected.

Table II: DIMENSIONAL REQUIREMENTS FOR DEFORMED STEEL WIRE FOR CONCRETE REINFORCEMENT

| Deformed Wire | Unit Weight | Diameter | Cross-Sectional Area, | Perimeter |
|---|---|---|---|---|
| Size No | Pounds Per Ft. (Kgs per Meter) | Inches (Centimeters) | Sq. inches (Sq, Centimeters) | Inches (Centimeters) |
| D-1 | 0.034 (.051) | 0.113 (.287) | 0.01 (.06) | 0.355 (.902) |
| D-2 | 0.068 (.101) | 0.159 (.404) | 0.02 (.13) | 0.499 (1.267) |
| D-3 | 0.102 (.152) | 0.195 (.495) | 0.03 (.19) | 0.612 (1.554) |
| D-4 | 0.136 (.202) | 0.225 (.572) | 0.04 (.26) | 0.706 (1.793) |
| D-5 | 0.170 (.253) | 0.252 (.640) | 0.05 (.32) | 0.791 (2.009) |
| D-6 | 0.204 (.304) | 0.276 (.701) | 0.06 (.39) | 0.867 (2.202) |
| D-7 | 0.238 (.354) | 0.296 (.752) | 0.07 (.45) | 0.936 (2.377) |
| D-8 | 0.272 (.405) | 0.319 (.810) | 0.08 (.52) | 1.002 (2.545) |
| D-9 | 0.306 (.455) | 0.338 (.859) | 0.09 (.58) | 1.061 (2.695) |
| D-10 | 0.340 (.506) | 0.356 (.904) | 0.10 (.65) | 1.118 (2.840) |

| | | | | |
|---|---|---|---|---|
| D-11 | 0.374 (.557) | 0.374 (.950) | 0.11 (.71) | 1.174 (2.982) |
| D-12 | 0.408 (.607) | 0.390 (.991) | 0.12 (.77) | 1.225 (3.112) |
| D-13 | 0.442 (.658) | 0.406 (1.031) | 0.13 (.84) | 1.275 (3.239) |
| D-14 | 0.476 (.708) | 0.422 (1.072) | 0.14 (.90) | 1.325 (3.366) |
| D-15 | 0.510 (.759) | 0.437 (1.110) | 0.15 (.97) | 1.372 (3.485) |
| D-16 | 0.544 (.810) | 0.451 (1.146) | 0.16 (1.03) | 1.416 (3.600) |
| D-17 | 0.578 (.860) | 0.465 (1.181) | 0.17 (1.10) | 1.460 (3.708) |
| D-18 | 0.612 (.911) | 0.478 (1.214) | 0.18 (1.16) | 1.501 (3.813) |
| D-19 | 0.646 (.961) | 0.491 (1.247) | 0.19 (1.23) | 1.542 (3.917) |
| D-20 | 0.680 (1.012) | 0.504 (1.280) | 0.20 (1.29) | 1.583 (4.021) |
| D-21 | 0.714 (1.063) | 0.517 (1.313) | 0.21 (1.35) | 1.624 (4.125) |
| D-22 | 0.748 (1.113) | 0.529 (1.344) | 0.22 (1.42) | 1.662 (4.221) |
| D-23 | 0.782 (1.164) | 0.541 (1.375) | 0.23 (1.48) | 1.700 (4.318) |
| D-24 | 0.816 (1.214) | 0.553 (1.405) | 0.24 (1.55) | 1.737 (4.412) |
| D-25 | 0.850 (1.265) | 0.564 (1.433) | 0.25 (1.61) | 1.772 (4.500) |
| D-26 | 0.884 (1.316) | 0.575 (1.461) | 0.26 (1.68) | 1.806 (4.587) |
| D-27 | 0.918 (1.366) | 0.586 (1.488) | 0.27 (1.74) | 1.841 (4.676) |
| D-28 | 0.952 (1.417) | 0.597 (1.516) | 0.28 (1.81) | 1.876 (4.765) |
| D-29 | 0.986 (1.467) | 0.608 (1.544) | 0.29 (1.87) | 1.910 (4.851) |
| D-30 | 1.020 (1.518) | 0.618 (1.570) | 0.30 (1.94) | 1.942 (4.933) |
| D-31 | 1.054 (1.569) | 0.628 (1.595) | 0.31 (2.00) | 1.973 (5.011) |

O. Polyethylene Film

Polyethylene film shall be opaque pigmented white in color and shall be manufactured from virgin resin without additives or scrap. It shall be sufficiently strong and tough to permit its use under the conditions existing on street paving work without being torn or otherwise rendered unfit for the purpose during the curing period. The film shall have a minimum thickness of 4 mils (0.004 inch), shall have a minimum tensile strength of 1,700 psi at 77°F (11,720 kPa at 25°C) in the longitudinal direction and 1,200 psi at 77°F (8,275 kPa at 25°C) in the transverse direction and shall have a minimum elongation of 200 percent at 77°F (25°C)in the longitudinal direction and 150 percent at 77°F(25°C) in the transverse direction. The permissible percent moisture loss shall not exceed 2 percent after 24 hours and 4 percent after 72 hours. Tests for tensile strength and elongation will be conducted in accordance with ASTM Designation: D 882, Method A. Tests for moisture retention will be conducted in accordance with ASTM Designation: C 156.

P. Membrane Curing Compound

Membrane curing compound shall conform to Item No. 409S, "Membrane Curing", Type 2 white pigmented.

Q. Asphalt Curing

Where asphalt is to be placed on a concrete base, asphalt shall be used for curing concrete base, the material shall conform to Item No. 301S, "Asphalts, Oils and Emulsions" for RS-2 or RS-2h or as indicated on the drawings.

## 360S.4 Equipment

A. General

All equipment necessary for construction of this item shall be on the Project and shall be approved by Engineer or designated representative as to conditions before the Contractor will be permitted to begin construction operations on which the equipment is to be used. When approved by the Engineer or designated representative in writing, a commercial or independently operated batching plant for measuring materials outside limits of the project may be used.

B. Mixer

The mixer furnished may be either a paving mixer (operated at site of construction or centrally located), a stationary mixer (central mixer) or a paving mixer (truck mounted) that will produce adequately mixed concrete meeting the specified requirements. The mixer, or mixers, shall conform to the following requirements:

1) Each mixer shall have attached in a prominent place a manufacturer's plate showing rated capacity of the drum in terms of volume of mixed concrete and the recommended speed of rotation of the mixing drum or blades.

2) The stationary mixer (central mixer) or truck mounted paving mixer shall be operated at the manufacturer's recommended speed.

3) The size of the paving mixer shall not be less than that of a 27-E paver, as established by the Mixer Manufacturer's Bureau of Associated General Contractors. The paving mixer shall be operated at a drum speed of not less than 16 revolutions per minute and not more than 22 revolutions per minute. Pickup and throw over blades in the drum of the mixer shall be replaced when worn down 3/4 inch (19 mm) or more.

4) Each truck mounted paving mixer shall be approved by the Engineer or designated representative prior to use on the project. It shall be classified as a "paving mixer" by the manufacturer and shall be so designed that a uniform and low slump concrete (approximately 1 1/2 inch [38 mm] slump) can be mixed without aggregate size segregation. The mixer shall be capable of discharging the low slump concrete at a speed of 10 seconds per cubic yard (13 seconds per cubic meter) or faster.

5) Each mixer shall be equipped with an approved automatic device for satisfactorily timing the mix and locking the discharging device in order to prevent the discharging of the mixer before the end of the required mixing period. This timing device shall operate a sounding device to signal plainly the completion of the mixing time. When permitted by the Engineer a light signal device may be used.

6) Multiple drum mixers will be permitted provided their operation is properly synchronized. The mixing time shall be determined exclusive of the time required to transfer concrete from one drum to the next drum.

7) Each mixer shall be equipped with a water-measuring device so constructed that it will measure the water within 1 percent of the total amount required for each batch. Unless the water is to be weighed, the water measuring equipment shall include an auxiliary tank with a capacity greater than that of the measuring tank and from which the measuring tank will be filled by gravity flow. The measuring tank shall be open to the atmosphere and shall be so placed and constructed that the water for a batch can be discharged into a calibrated tank or weighing device for checking the accuracy of water measurement without seriously delaying the paving operations. The Contractor shall have a calibrated tank or weighing device available at all times at a location satisfactory to the Engineer or designated representative.

8) If a paving mixer is furnished and operated at the site of construction, it shall be equipped with a power controlled boom and bucket, so designed as to permit uniform distribution of the concrete for the full width between pavement forms. Alternate equipment for distributing concrete may be substituted when approved by the Engineer in writing, provided uniform distribution is obtained without segregation.

9) If central mixed concrete is used on the project, the Contractor shall provide equipment designed to provide uniform distribution for the concrete for the full width between pavement forms without segregation.

C. Transit-mix Trucks

When transit-mix (ready-mix) concrete is used, additional mortar (1 sack cement, 3 parts sand and sufficient water) shall be added to the batch to coat the drum of the mixer or agitator truck. This shall be required for every load of concrete. The mixing speed shall be attained as soon as all ingredients are in the mixer. Each complete batch (containing all the required ingredients) shall be mixed not less than 70 nor more than 100 revolutions of the drum at mixing speed.

A portion of the mixing water, required by the batch design to produce the desired slump, may be withheld and added at the job site, but only with permission of the Engineer and under the Engineer's supervision. When water is added at the job site, 25 revolutions (minimum) at mixing speed, will be required to flush down the blades after charging shall be accurately measured and included in the quantity of mixing water. The introduction of the initial mixing water, except blade wash down water and that permitted in this Article shall be prior to or simultaneous with the charging of the aggregates and cementitious material.

Mixing and agitating speed shall be as designated by the mixer manufacturer. All revolutions after prescribed mixing shall be at agitating speed. Except for short periods of time during discharge, the drum shall be kept in continuous motion from the time the mixing is started until the discharge is completed.

Additional mortar, consisting of 1 sack cement, 3 parts sand and sufficient water, shall be added to the batch to coat the drum of the transit mixer or agitator truck. This shall be required for every load of concrete.

The loading of transit-mixers shall not exceed 63 percent of the drum volume. When used as an agitator only, the loading of truck mixers shall not exceed 80 percent of the drum volume.

The batching plant and transit-mix trucks shall operate under the following system:

1) A ticket system will be used that includes a copy for the construction inspector. The ticket will have machine stamped time/date of water/cement batch; weight of cement, fly ash (if applicable), water, sand and aggregates; exact nomenclature and quantities of admixture. Any item missing or incomplete on the ticket will be cause for rejection. Coded readouts may be used if approved in advance by the Engineer.

2) Sufficient trucks will be available to support continuous placements. The Contractor will satisfy the Engineer that adequate standby trucks are available to support monolithic placement when required.

3) A portion of the mixing water, required by the batch design to produce the desired slump, may be withheld and added at the job site, but only with the permission of the Engineer and under the Inspector's observation. When water is added under these conditions, it will be thoroughly mixed before any slump or strength beam samples are taken.

D. Hauling Equipment

Batch hauling equipment for the transportation of measured materials from the batching plant to the mixer shall be equipped with tight covers, which shall be used to prevent excessive evaporation of moisture or any loss of material.

If a central mixer is used, concrete may be transported to the point of delivery in truck agitators or non-agitating trucks.

If a truck mounted paving mixer is used, it may be used to transport the concrete after mixing is complete.

If non-agitator trucks are used they shall conform to the following requirements:

The bed of non-agitating hauling equipment shall be a smooth, mortar-tight, metal container. The hauling equipment shall be capable of delivering the concrete to the work site in a thoroughly mixed and uniform mass and capable of discharging the concrete at a satisfactory controlled rate without segregation. If in the opinion of the Engineer any appreciable segregation or accumulation of excess water and/or mortar occurs on the surface of the concrete, this may be cause for rejection and this method of transporting the concrete to the point of delivery shall be suspended as directed by the Engineer.

E. Subgrade or Subbase Planer and Templates

Unless a stabilized subbase is provided, an approved subbase planer shall be provided, mounted on visible rollers riding on the forms and having adjustable cutting blades which shall trim the subgrade to the exact section as indicated. The planer frame shall be heavy enough to remain on the forms at all times and shall be of such strength and rigidity that, under a test made by changing the support from the wheels to the center, it shall not develop a deflection for more than 1/8 inch (3 mm). Tractive power equipment used to pull the planer shall not be such as to produce ruts or indentations in the subgrade.

When the slip form method of paving is to be used, the subgrade planer will be operated on a prepared track grade or controlled by an electronic sensor system operated from a string line that establishes the horizontal alignment and the elevation of the subbase.

A template for checking the contour of the subbase shall be provided and operated by the Contractor. The template shall rest upon the side forms and shall be of such strength and rigidity that, under a test made by changing the support to the center, it shall not show a deflection of more than 1/8 inch (3 mm). It shall be provided with accurately adjustable rods projecting downward to the subgrade at 1-foot (30 cm) intervals and these rods shall be adjusted to the required cross section of the bottom of the slab when the template is resting upon the side forms. Where stabilized subbase is provided, use of a scratch template will be required.

F. Forms

Side forms shall be of metal of approved cross section. The preferred depth of the form shall be equal to the required edge thickness of the pavement. Forms with depth greater than the required edge thickness of the pavement will be permitted.

The length of form sections shall not be less than 10 feet (0.3 meters) and each section shall provide for staking in position with not less than 3 pins. Flexible or curved forms of wood or metal of proper radius shall be used for curves of 200-foot (61 meter) radius or less. Forms shall be of ample strength and shall be provided with adequate devices for secure setting so that when in place they will withstand, without visible springing or settlement, the impact and vibration of the spreading

and finishing machinery. In no case shall the base be less than 6 inches (15.2 cm) for a form 6 inches (15.2 cm) or more in height. The forms shall be free from warps, bends or kinks and shall be sufficiently true to provide a reasonably straight edge on the concrete. The top of each form section, when tested with a straightedge shall conform to the requirements specified for the surface of the completed pavement. Sufficient forms shall be provided for satisfactory prosecution of the work.

Outside curb forms shall be of wood or metal of a section satisfactory to the Engineer or designated representative, straight, free of warp and shall be in a depth at least equal to the depth of the curb. They shall be mounted on the paving forms and securely attached thereto and maintained in true position during the placing of the concrete. Inside curb forms, if required, shall be of approved material and of such design as to provide the curb required and shall be rigidly attached to the outside forms.

G. Concrete Spreader

Use of concrete spreader shall be required and it shall be a self-propelled machine having sufficient power and traction to spread and strike off concrete without slippage on the forms. It shall be equipped with a power driven device for spreading the concrete uniformly between the forms. The spreading device may be either a reciprocating blade, a screw conveyer or a belt conveyer. The spreader shall be capable of striking off the surface of the concrete between the forms in the longitudinal direction of the slab at any required elevation.

Mechanically operated concrete spreaders of other designs, which uniformly distribute the concrete with a minimum of segregation, may be used when approved by the Engineer.

H. Slipform Paver

With prior approval, the Contractor may place concrete with slip form paver. This paver shall be equipped with a longitudinal trans-angular finishing float adjustable to crown and grade and be satisfactory to the Engineer or designated representatve. The float shall extend across the pavement practically to the side forms and/or the edge of slab. A "string line" shall be used to provide grade control for the paver.

I. Mechanical Vibratory Equipment

All concrete placed for pavement shall be consolidated by approved mechanical vibrators operated ahead of the transverse finishing machine and designed to vibrate the concrete internally and/or from the surface. Vibratory members shall extend across the pavement practically to, but shall not come in contact with the side forms. Mechanically operated vibrators shall be mounted in such manner as not to interfere with transverse or longitudinal joints. The internal-type vibrators shall be spaced at not more than 24 inches (61 cm) and shall be equipped with synchronized vibratory units. Separate vibratory units shall be spaced at sufficiently close intervals to provide uniform vibration and consolidation to the entire width of the pavement. The frequency in air of the interval spud type vibratory units shall be not less than 8,000 cycles per minute and not less than 5,000 cycles per minute for tube types and the method of operation shall be as

directed by the Engineer or designated representative. The Contractor shall have a satisfactory tachometer available for checking vibratory the elements.

The pavement vibrators shall not be used to level or spread the concrete but shall be used only for purposes of consolidation. The vibrators will not be operated where the surface of the concrete, as spread, is below the elevation of the finished surface of the pavement, except for the first lift of concrete where double strike off method of placement is employed and the vibrators shall not be operated for more than 15 seconds while the machine upon which they are installed is standing still.

The pan type vibratory units shall apply the vibrating impulses directly to the surface of the concrete. The operating frequency shall be not less than 3,500 cycles nor more than 4,200 cycles per minute in air. The Contractor shall have a satisfactory tachometer available for checking the speed of the vibratory elements.

Approved hand manipulated mechanical vibrators shall be furnished in the number required for provision of proper consolidation of the concrete along forms, at joints and in areas not covered by mechanically controlled vibrators. These vibrators shall be sufficiently rigid to insure control of the operating position of the vibrating head.

Complete and satisfactory consolidation of the concrete pavement is a most important requirement of this specification. Cores taken shall be carefully examined for voids, honeycombing or other evidence of incomplete consolidation. If such evidence is present, changes in the consolidation procedures and/or equipment will be made to insure satisfactory consolidation.

J. Finishing Equipment

1. Transverse Finishing Machine

The Transverse finishing machine shall be provided with 2 screeds accurately adjusted to the crown of the pavement, shall be self-propelled and mounted in a substantial frame equipped to ride on the forms, or may be slip form finished, and shall be so designed and operated as to strike off and consolidate the concrete.

2. Longitudinal Finishing

A transverse drag float may be used in lieu of the longitudinal finishing machine with the Engineer's approval. Finishing machines shall be maintained in a tight and good operating condition, accurately adjusted to the required crown or profile and free from deflection, wobble or vibration tending to affect the precision of finish. Machines failing to meet these requirements will be rejected by the Engineer or designated representative and the Contractor shall provide approved equipment.

Where hand finishing is permitted under this specification, the Contractor shall provide a strike template and a tamping template both of 4 by 10 inch (10 by 25 cm) lumber or equivalent metal section and at least 2 feet longer than the width of the pavement. Both templates to conform to the crown section of the pavement and the tamp, if of wood, shall have a steel face not less than 3/8 inch (9.5 mm) in thickness. The Contractor shall also provide a

longitudinal float of approved design and not less than 14 feet (4.25 meters) in length.

The Contractor shall furnish and maintain at least two standard 10-foot (3.05 meter) steel straightedges on the work site at all times during the paving operations. The Contractor shall operate same in the presence of the Engineer or designated representative.

The Contractor shall furnish a sufficient number of bridges to ride on the forms and span the pavement for finishing operations and for the installation and finishing of joints. All necessary finishing and edging tools shall be furnished as may be required to complete the pavement as indicated.

## 360S.5 Proportioning of Concrete

A. Proportions

Concrete shall be composed of Cementitious Materials, fine aggregate, coarse aggregate, mineral filler and/or admixture if used and water, mixed in the proportions designated by the approved Mix Design and in the manner set forth in this specification. On the basis of job and laboratory investigations of the proposed materials, the Contractor will fix proportions by weight of water, coarse aggregate, fine aggregate, cementitious materials, admixture and mineral filler where required, in order to produce concrete of the specified strength and workability for the actual delivery time and site conditions to be encountered. Where curbs are placed separately, the Engineer or designated representative. may allow aggregate gradation conforming to Class A Concrete, Item No. 403S, "Concrete for Structures".

B. Concrete Strength

The concrete mix to be designed to produce a concrete with the following requirements:

| Table 1: CONCRETE PAVEMENT | | |
|---|---|---|
| Item | Test | Value |
| Entrained Air | Tex-416-A | 3 to 6 percent |
| Water-Cement Ratio gal.(liter)/sack, Maximum | | 6.25 (23.66) |
| Sacks Cement, Minimum, 4 pounds (42.6 KG) ea | | 6 per cubic yard (7.85 per cubic meter) |
| Coarse Aggregate Factor | | 0.65 min - 0.85 max. |
| Compressive Strength after 7 Day, psi | Tex-418-A | 4000 (27,600) |

| | | |
|---|---|---|
| (kPa) | | |
| Compressive Strength after 28 day, psi (kPa) | Tex-418-A | 4500 (31,000) |
| Maximum Concrete Mix Temperature $^{o}$F ($^{o}$C) | | 95 (35) |
| Retarder: Regular Concrete increase in time over 360S.7(3) , minutes, Maximum | | 60 |

| Table 2: HIGH EARLY STRENGTH CONCRETE | | |
|---|---|---|
| Item | Test | Value |
| Cement Type | | III |
| Entrained Air | Tex-416-A | 3 to 6 percent |
| Water-Cement Ratio gal. .(liter)/sack, Maximum | | 6.25 (23.66) |
| Sacks Cement, Minimum, 94 pounds (42.6 KG) ea | | 7 per (9.16 per cubic meter) |
| Coarse Aggregate Factor | | 0.65 min-0.85 max |
| Slump, inches (Centimeters) | Tex-415-A | 1/2 to 2 (1.25 to 5.0) |
| Compressive Strength, after 24 hours, psi (kPa) | Tex-418-A | 2,100 (14,500) |
| Compressive Strength, after 3 days, psi (kPa) | Tex-418-A | 2,750 (19,000) |
| Compressive Strength, after 7 Days, psi (kPa) | Tex-418-A | 4,500 (31,000) |
| Compressive Strength, after 28 Days, | Tex-418-A | 4,925 (34,000) |

| | | |
|---|---|---|
| psi (kPa) | | |
| Maximum Concrete Mix, Temperature oF (oC) | | 95 (35) |

The Contractor may submit a mix design using high range water reducing admixtures conforming to Item No. 405S, "Concrete Admixtures" in lieu of the concrete pavement mix specified and shall meet the following requirements:

| Table 3: HIGH RANGE WATER REDUCING ADMIXTURES: SUPERPLASTERSIZER CONFORMING TO SPECIFICATION ITEM NO. 405S, "CONCRETE ADMIXTURES" | | |
|---|---|---|
| Item | Test | Value |
| Entrained Air | Tex-416-A | 3 to 6 percent |
| Water-Cement Ratio, (liter)//sack, Maximum | | 6.25 |
| Sacks Cement, Minimum, 94 pounds (42.6 KG) ea | | 6 per cubic yard(7.85 per cubic meter) |
| Coarse Aggregate Factor | | 0.65 min. - 0.85 max. |
| Slump, inches (cms) before Admixture | Tex-415-A | 1/2 to 2 (1.25 to 5) |
| Slump, Inches (cms) after Admixture | Tex-415-A | 4 to 10 (2.5 to 25) |
| Compressive Strength, after 3 days, psi (kPa) | Tex-418-A | 3,125 (21,500) |
| Compressive Strength, after 7 days, psi, (kPa) | Tex-418-A | 4,500 (31,000) |
| Compressive l Strength, after 28 days, psi (kPa) | Tex-418-A | 4,925 (34,000) |
| Maximum Concrete Mix, Temperature, $^{o}$F ($^{o}$C) | | 100 (37.8) |
| Retarder, Regular Concrete Over 360S.7C, Minutes, Maximum | | 120 |

| Table 4: Over Design Required to Meet Compressive Strength Requirements1 | | | | | |
|---|---|---|---|---|---|
| Number Of Tests2,3 | Standard Deviation, psi (mPa) | | | | |
| | 300 (2.06 ) | 400 (2.75 ) | 500 (3.44 ) | 600 (4.13) | 700 (4.82 ) |
| 15 | 470 (3.24 ) | 620 (4.27) | 850 (5.85) | 1,120 (7.71) | 1,390 (9.57) |
| 20 | 430 (2.96 ) | 580 (3.99) | 760 (5.23) | 1,010 (6.95) | 1,260 (8.67) |
| 30 or more | 400 (2.75 ) | 530 (3.65) | 670 (4.61) | 900 (6.20) | 1,130 (7.78) |

Notes:

1. When designing the mix, add the tabulated amounts to the minimum design strength in Tables 1, 2 or 3.Maximum water-cement or water-cementitious ratio by weight

2. Number of tests of a concrete mixture used to estimate the standard deviation of a concrete production facility. Test of another mix within 1,000 psi (6.88 MPa) of the specified strength may be used.

3. If less than 15 prior tests are available, the overdesign should be 1,200 psi (8.26 MPa) for specified strengths from 3,000 to 5,000 psi (20.65 to 34.42 MPa) and 1,400 psi (9.64 MPa) for specified strengths greater than 5,000 psi (34.42 MPa).

High range water reducing admixtures shall be capable of maintaining the original slump until placement and screeding, which may be 2 hours, without the addition of water, additional admixture or other retempering or remixing techniques.

C. Workability of Concrete

Concrete shall be uniformly plastic, cohesive and workable. Workable concrete is defined as concrete which can be placed without honeycomb and without voids in the surface of the pavement after the specified finishing machine has been over a given area twice. Workability shall be obtained without producing a condition such that free water appears on the surface of the slab when being finished as specified. Where water appears on the surface of the concrete after finishing and this condition cannot be corrected by reasonable adjustment in the batch design, the bleeding to be immediately corrected by one of the following measures or a combination of two or more of the following listed measures:

1. Redesign of the batch.

2. Addition of mineral filler to fine aggregates.

3. Increase of cement content.

4. Use of an approved air entraining agent or approved admixture.

In the event that the measures taken do not eliminate the bleeding immediately, concrete placement operations will be suspended, as directed by the Engineer or designated representative, by placing a bulkhead or "header" as indicated and

according to applicable requirements for intentional stoppage of placement of concrete under Item No. 360S, "Concrete Pavement" and will remain suspended until such time as additional trial mixes demonstrate that a non-bleeding batch design has been achieved. Failing to achieve a satisfactory laboratory batch design the Contractor will be required to use different materials and to submit samples thereof for additional trial mixes and pilot beams.

The mix will be designed with the intention of producing concrete, which will have a slump of 1 1/2 inches (3.8 cms). The slump shall not be less than 1/2 inch (1.25 cms) nor more than 2 inches (5 cms).

D. Mix Design

The Contractor shall be responsible for the design of the concrete mix. The mix design shall be prepared and sealed by a person qualified and experienced in such work. Establish proportions on the basis either of laboratory trial batches or of field experience with the materials to be employed.

When ice is used to lower the concrete temperature during hot weather concrete placement (Section 13 of Standard Specification Item No.410S, “Concrete Structures”), the Contractor shall furnish a mix design (Section 6 of Standard Specification Item No. 403S, “Concrete for Structures”) acceptable to the Engineer or designated representative for class of concrete specified. The addition of ice shall not exceed 50% of the total mix water weight.

Complete concrete mix design data shall be submitted to the Engineer or designated representative for approval at least 10 days before concrete placement begins. Submittal of the mix shall be accompanied by such test data and certifications as may be necessary to demonstrate compliance with specification requirements. Approval of this mix design shall in no way relieve the Contractor of responsibility for the quality of the concrete.

It shall also be the responsibility of the Contractor to determine and measure batch quantity of each ingredient, including water, not only for batch designs but for all concrete produced for the project, so that the mix conforms to these specifications.

Trial batches shall be made and tested using all the proposed ingredients prior to the placing of concrete and also when the aggregate and/or type, brand or source of cement or admixture is changed. When the brand and/or source of cement only is changed, the Engineer or designated representative may waive trial batches only if a prior record of satisfactory performance of the cement has been established.

Mix designs used successfully on previous or concurrent jobs may be approved by the Engineer or designated representative without trial batches if it is shown that there is no substantial change in any of the proposed ingredients.

The Contractor shall prepare a minimum of four concrete test beams of each mix design, cure and test two each at the age of 7 and 28 days. From these preliminary tests the water-cement ratio required to produce concrete of the specified strength will be selected by the Contractor for approval by the Engineer or designated representative. The Contractor may at any time present in writing a suggested mix design and if the Engineer or designated representative concurs with the suggested design, the Contractor shall conduct trial batches necessary to determine its acceptability under these specification requirements.

The Contractor shall furnish and operate the mixer approved for use on this project unless the concrete is to be furnished from a transit mix (ready-mix) plant. For mixing the concrete to be used in making the preliminary test specimens, a minimum 1 cubic yard (1 cubic meter) batch shall be mixed or a batch of sufficient size to afford proper mixing, whichever is the greater. In lieu of the above mixer and procedure, the Contractor may furnish a portable mixer of sufficient rated capacity to mix a minimum 3-sack batch; in which case, the batch mixed for the preliminary test not to be less than the rated capacity of the mixer furnished. A coating batch will be mixed prior to mixing for test beams.

No additional compensation to be allowed for equipment, materials or labor involved in making job mix design test specimens.

After the mix proportions and water-cement ratio required to produce concrete of the specified strength have been determined, placing of the concrete may be started. The strength of the concrete in the completed pavement will be determined by a minimum of four compressive strength test specimens made, cured with a minimum of two each tested at 7 and 28 days as provided in Texas DOT Bulletin C-11. Modifications of the mix design may be requested by the Contractor on basis of conformity of the strength of these test specimens with the requirements and intent of this specification.

Changes in the water-cement ratio and the mix design, including an increase in cement factor if necessary, will be made when the average 7 day and/or 28 day compressive strength of the concrete, as indicated by the last 10 compressive strength values obtained from tests of cylinders made from concrete of the same water-cement ratio, departs from the desired minimum average strength by more than 4 percent.

E. Construction Testing:

Straightedge surface testing to be carried out as prescribed above.

The Engineer shall take test cylinders for compressive strength values on a random basis. The comparative results shall consist of the average of 2 cylinders each at 7 and 28 days for regular concrete, High early strength concrete and high range water reducing admixture concrete. Tests shall be made for each 500 square yards constructed, in accordance with TxDOT Bulletin C-11. Additional tests may be taken as determined by the concrete placement conditions or for adequately determining the strength of concrete where the early opening of the pavement to traffic is dependent upon concrete strength tests. No extra compensation will be allowed for materials and work involved in fulfilling these requirements.

## 360S.6 Construction Methods

A. Preparation of Subgrade

Where stabilized subbase is not provided, the subgrade shall be excavated as required, all unstable or otherwise objectionable material removed and all holes, ruts and depressions filled with approved material and compacted. Rolling and sprinkling shall be performed when and to the extent required and the roadbed

shall be completed to or above the plane of the typical sections, lines and grades indicated or as established by the Engineer or designated representative. The subgrade shall be proof rolled and any soft areas shall be repaired before the forms are placed. In the event that the proof rolled subgrade is exposed to rainfall or other conditions, which may soften the subgrade, corrective measures shall be taken and the subgrade shall be proof rolled again.

The subgrade planer shall be operated from approved forms immediately ahead of paving operations and the subgrade shall be finished to the exact section of the bottom of the pavement as indicated. Where traveling form pavers are used, the subgrade planer shall operate on a prepared track grade or be controlled by electronic sensors operating from a stringline that establishes line and grade. It shall be tested with the approved template, operated and maintained by the Contractor. The subgrade shall be maintained in a smooth, compacted condition in conformity with the required section and established grade until the pavement is placed and shall be kept thoroughly wetted down sufficiently in advance of placing any pavement to insure its being in a firm and moist condition for at least 2 inches (5 cms) below the prepared surface. Sufficient subgrade shall always be prepared in advance to insure satisfactory prosecution of the work.

No equipment or hauling shall be permitted on the prepared subgrade, except by special permission of the Engineer or designated representative, which will be granted only in exceptional cases and only where suitable protection in the form of 2-ply timber mats or other approved material is provided.

B. Placing and Removing Forms

The subgrade under the forms shall be firm and cut true to grade so that each form section when placed will be firmly in contact for its whole length and base width and exactly at the established grade. Any subgrade under the forms below established grade shall be corrected, using suitable material, placed, sprinkled and rolled as directed. Forms shall be staked with at least 3 pins for each 10-foot (3-meter) section. A pin shall be placed at each side of every joint. Form sections shall be tightly joined and keyed to prevent relative displacement. Forms shall be cleaned and oiled each time they are used.

Forms shall be set for a sufficient distance in advance of the point where concrete is being placed to permit a finished and approved subgrade length of not less than 300 feet (90 meters) ahead of the mixer. Conformity of the grade and alignment of forms shall be checked immediately prior to placing concrete and necessary corrections made by the Contractor. Where any form has been disturbed or any subgrade becomes unstable, the form shall be reset and rechecked. In exceptional cases, the Engineer or designated representative may require suitable stakes driven to the grade of the bottom of the forms to afford additional support. Sufficient stability of forms to support the equipment operated and to withstand its vibration without springing or settlement shall be required. If forms settle and/or deflect over 1/8 inch (3 mm) under finishing operations, paving operations shall be stopped and the forms shall be reset to line and grade.

Forms shall be leveled using cement-stabilized material containing not less than 1 1/2 sacks of cement per ton (1 2/3 sacks of cement per MG) of mix as placed. The aggregate gradation and water content shall be determined by the Contractor. The cement-stabilized material shall be sufficiently plastic to insure filling voids

underneath the paving forms. Paving equipment will not to be permitted on the forms until the cement-stabilized material has cured for at least 12 hours.

Forms shall remain in place for not less than 8 hours after the concrete has been placed. Forms shall be carefully removed in such a manner that little or no damage will be done to the edge of the pavement. Any damage resulting from this operation shall be immediately repaired. After the forms have been removed, the ends of all joints shall be cleaned and any honeycombed areas pointed up with approved mortar and the surfaces protected with curing material conforming to Item No. 409S, "Membrane Curing".

Immediately after pointing is complete, the form trench, if used, shall be filled with granular material or earth from the shoulders in such manner as to shed water from rainfall and prevent curing material from washing away from the edge of pavement. On completion of the required curing, the subgrade or shoulders adjacent to the pavement shall be placed and compacted in condition to maintain drainage.

## 360S.7 Concrete Mixing and Placing

A. Mixing Methods

The concrete shall be mixed in a mixer conforming to the requirements of this item.

B. Mixing

The aggregates, mineral filler if required, cementitious materials and water shall be measured separately, introduced into the mixer and mixed for a period of not less than 50 seconds nor more than 90 seconds, measured from the time the last aggregate enters the drum to the time discharge of the concrete begins. The required water shall be introduced into the mixing drum during the first 15 seconds of mixing. The entire contents of the drum shall be discharged before any materials of the succeeding batch are introduced.

The Engineer or designated representative may increase the minimum mixing time to that necessary to produce thoroughly mixed concrete based on inspection or appropriate uniformity tests. The mixing time may be varied at any time as necessary to produce acceptable concrete.

If a central mixer is used, the concrete shall be discharged into the specified hauling equipment and delivered to the road site. If truck agitators are used, the concrete shall be continuously agitated at not less than 1 nor more than 6 rpm as directed by the Engineer or designated representative.

The maximum size of the concrete batch, absolute volume, shall not exceed 120 percent of the rated size of the mixer (40.8 cubic feet maximum batch for 34 cubic foot paver-1.2 cubic meter maximum batch for 1 cubic meter paver ). Spilling of material from the mixer drum shall be corrected by reducing the size of the batch. Retempering or remixing of concrete will not be permitted.

The initial batch of concrete mixed after each time the mixer is washed out shall be enriched by additional mortar. The additional mortar shall be 1 sack of cement and 3 parts of sand.

When transit-mix (ready-mix) concrete is permitted, the batching plant shall meet the requirements of Item 403S, "Concrete for Structures".

C. Placement

Unless otherwise indicated, the concrete may be placed by using forms or by use of a slipform paver. Any concrete not placed as herein prescribed within 30 minutes after mixing shall be rejected and disposed of as directed except as provided otherwise herein. If in the opinion of the Engineer or designated representative, the temperature, wind and/or humidity conditions are such that the quality of concrete will not be adversely affected, the specified placing time may be extended by a maximum of 45 minutes. Concrete with high range water reducing admixture shall not be placed after the slump has dropped by 3 inches (7.5 cms) or more. Except by specific written authorization of the Engineer or designated representative, concrete shall not be placed when the temperature is below 40oF (4.5oC) and falling but may be placed when the temperature is above 35oF (1.7oC) and rising, the temperature being taken in the shade and away from artificial heat.

When the temperature of the air is above 85oF (29.4oC), an approved retarding agent will be required in concrete. The maximum temperature of all regular concrete placed shall not exceed 95oF (35.0oC), unless otherwise specified.

When concrete is being placed in cold weather, the Contractor shall have available a sufficient supply of an approved covering material to immediately protect concrete if the air temperature falls to 32oF (0oC) or below, before concrete has been placed 4 hours. Such protection shall remain in place during the period the temperature continues below 32oF (0oC) or for a period of not more than 5 days. Neither salt nor other chemical admixtures shall be added to the concrete to prevent freezing. The Contractor shall be responsible for the quality and strength of concrete under cold weather conditions and any concrete damaged by freezing shall be removed and replaced at the Contractor's expense. Concrete shall not be placed before sunrise and shall not be placed later than will permit finishing of the pavement during sufficient natural light.

Concrete shall be placed only on approved subgrade or subbase and unless otherwise indicated on the drawings, the full width of the pavement shall be constructed monolithically. The concrete shall be deposited on the subgrade or subbase in such manner as to require as little rehandling as possible. Where hand spreading is necessary, concrete shall be distributed to the required depth by use of shovels. The use of rakes will not be permitted. Workers will not be permitted to walk in the concrete with any earth or foreign material on their boots or shoes. The placing of concrete shall be rapid and continuous.

When the concrete is to be placed in separate lanes, the junction line shall not deviate from the true line more than 1/2 inch (1.25 cm) at any point and shall be finished as indicated on the drawings.

The mixer shall not be located on completed pavement, except as herein provided, but may be located on the subgrade of that lane of the pavement being constructed, as provided under "Preparation of Subgrade". When limited space, in the opinion of the Engineer or designated representative, requires operation of the mixer on completed pavement, the mixer may be so operated provided the concrete has attained the minimum average compressive strength required and

provided suitable protection to the pavement in the form of 2 ply timber mats or otherwise approved material is provided.

Concrete shall be distributed to such depth that when consolidated and finished, the slab thickness indicated will be obtained at all points and the surface shall not, at any point, be below established grade. Special care shall be exercised in placing and spading concrete against forms and at all joints to prevent the forming of honeycombs and voids.

Concrete for the monolithic curbs shall be the same as for the pavement and if carried back from the paving mixer shall be placed within 20 minutes after being mixed. It may be placed from the separate mixer, if desired, but in any case must be placed while the pavement concrete is still plastic. When sawed joints are used, curbs shall be doweled as indicated and poured after sawing. Curbs doweled on and placed separately may be placed with an extrusion machine.

If a central mixer or batcher is used, the Contractor shall provide a system satisfactory to the Engineer or designated representative for determining that concrete delivered to the road meets the specified requirements for mixing and time of placing.

Unless otherwise indicated, 2 mixers or transit mixers will be required where the double strike off method is employed.

D. Reinforcing Steel and Joint Assemblies

All reinforcing steel, including steel, welded wire fabric reinforcement, tie bars, dowel bars and load transmission devices used in accordance with plan provisions shall be accurately placed and secured in position in accordance with details indicated on the drawings. Reinforcing bars shall be securely wired together at alternate intersections, following a pattern approved by the Engineer or designated representative and at all splices and shall be securely wired to each dowel intersected. When wire fabric is used, it shall replace only the longitudinal and transverse bars and shall be securely wired together at all splices and to each dowel intersected. When welded wire fabric is selected, the Contractor shall pour the lower half of the slab, place the welded wire fabric and place the remaining concrete. Tie bars shall be installed in the required position by the method and device indicated. Bar coating indicated and of material specified, shall be completed and the bars and coating shall be free of dirt or other foreign matter at the time of installation in the concrete.

Tightly adhered scale or rust which resists removal by vigorous wire brushing need not be removed except that excessive loss of section to the reinforcement due to rust shall be cause for rejection. Excessive loss of section shall be defined as loss of section to the extent that the reinforcement will no longer meet the physical requirements for the size and grade of steel specified.

Where indicated on the drawings, an assembly of parts at pavement joints, the assembly shall be completed, placed at required location and elevated and all parts rigidly secured in required position by the method and devices indicated on the drawings. Dowel bars shall be accurately installed in joint assemblies as indicated on the drawings, each parallel to the pavement surface and to the center line of the pavement and shall be rigidly secured in the required position by such

means as indicated that will prevent their displacement during placing and finishing of the concrete. Unless specifically authorized by the Engineer or designated representative in writing, the load transmission devices shall be accurately installed in joint assemblies indicated, each unit vertical with its length parallel to the center line of the pavement and all units shall be rigidly secured in required position by such means as indicated that will prevent their displacement during placing and finishing of the concrete. Header boards, joint filler and other material used for forming joints shall be accurately notched to receive each load transmission device. All load transmission devices shall be free of rust and clean when installed in the concrete.

The Contractor has the option of substituting welded wire fabric in place of reinforcement bars. The welded wire fabric selected shall have an area and distribution of steel at least equal to the plan requirements. The Contractor shall submit their proposed design to the Engineer for approval before any material is ordered.

If welded wire fabric is used, the entire width of the bottom layer of concrete shall be struck off to conform to the cross section and elevation indicated on the drawings. The reinforcement shall then be placed immediately upon the concrete, after which the top layer of concrete shall be placed, struck off and screeded. Any portion of the bottom layer of concrete which has been placed more than 15 minutes without being covered with the top layer of concrete shall be removed and replaced with freshly mixed concrete at the Contractor's expense.

E. Joints

1. General

All transverse and longitudinal joints when required in the pavement shall be of the types indicated and shall be at required location, on required alignment, in required relationship to tie bars and joint assemblies and in accordance with details indicated. When no transverse joints are indicated, joints shall not exceed 40 feet (13.1 meters). Such stakes, braces, brackets or other devices shall be used as necessary to keep the entire joint assembly in true vertical and horizontal position. Where concrete base is overlaid by asphaltic concrete, the joints to be prepared as specified herein, but joint sealing will not be required unless indicated.

If necessary for proper installation of the sealer, excessive spalling of the joint groove shall be repaired to the satisfaction of the Engineer.

Care shall be exercised during the construction of all joints to insure that the concrete sections are completely separated by an open joint or by the joint materials and to insure that the joints will be true to the outline indicated on the drawings. The Contractor shall install joint materials, which will function as a compatible system. Joint sealer shall not be placed where a bond breaker is present.

Green concrete or wet sawed joints are permitted provided the Contractor cleans the joint within 5 minutes after cutting with a 3000 psi (20.7 mPa) water blast followed by a minimum of 7 day cure and sand blast the saw cut immediately prior to placing joint sealer.

Dry sawed joints are permitted provided the Contractor sand blasts the saw cut immediately prior to placing joint sealer.

2. Expansion Joints

Transverse expansion joints shall be formed perpendicular to the centerline and surface of pavement and shall be constructed in accordance with the sequence of operations indicated on the drawings. After the transverse finishing machine and before the longitudinal finishing machine have passed over the joint, the Contractor shall test the joint filler for correctness of position and make any required adjustment in the position of the filler and shall install the joint seal space form as indicated on the drawings. After removal of the joint seal form as indicated on the drawings, the joint seal space above the joint filler shall be thoroughly sandblasted or machine routed to remove all projecting concrete, laitance, dirt or foreign matter. The concrete faces of the joint seal space shall be left true to line and section throughout the entire length of the joint. On completion of curing of the pavement, the joint sealing filler of the type specified shall be placed as indicated. The faces of the joint seal space shall be clean and surface dry at the time joint sealing filler is placed. On completion of the joint seal, the pavement adjacent to the joint shall be left free of joint sealing material. The joint seal space shall be exactly above and not narrower than the joint filler with no concrete overhangings.

3. Weakened Plane Joints

Weakened plane joints shall consist of transverse contraction joints and longitudinal joints and shall be formed or sawed as indicated on the drawings. When the joints are sawed, the saw shall be power driven, shall be manufactured especially for the purpose of sawing concrete and shall be capable of performing the work. Saw blades shall be as indicated. Tracks adequately anchored, the chalk, string line or other approved methods shall be used to provide true alignment of the joints. The concrete saw shall be maintained in good operating condition and the Contractor shall keep a standby power saw on the project at all times when concrete operations are under way.

If membrane curing is used, the portion of the seal, which has been disturbed by sawing operations, shall be restored by the Contractor by spraying the areas with additional curing seal.

Forming, finishing and sealing of the joint seal space shall conform to this item, described above and details indicated on the drawings.

4. Contraction Joints

Transverse contraction joints shall be formed or sawed joints perpendicular to the centerline and surface of the pavement and shall be constructed by the method and in the sequence of operations as indicated. Where sawed joints are used, contraction joints at intervals indicated shall be sawed as soon as sawing can be accomplished without damage to the pavement and before 24

hours after the concrete has been placed, the exact time to be approved by the Engineer or designated representative. The remaining contraction joints shall be sawed in a uniform pattern as directed by the Engineer or designated representative and they shall be completed before uncontrolled cracking of the pavement takes place. All joints shall be completed before placing concrete in succeeding lanes and before permitting traffic to use the pavement.

5. Longitudinal Joints

Longitudinal joints shall be of the type or alternate types indicated and shall be constructed of specified materials in accordance with provisions indicated on the drawings. Longitudinal joints shall be constructed accurately to required lines, shall be perpendicular to the pavement surface at the joint and the pavement surface over and adjacent to the joint shall be finished as specified on the drawings.

Longitudinal joints shall be sawed as soon as sawing can be accomplished without damage to the pavement. Sawing shall not cause damage to the pavement and the groove shall be cut with a minimum of spalling. No traffic (including construction traffic) shall be permitted on pavement until the longitudinal joint is cut.

6. Construction Joints

Intentional stoppage of the placing of the concrete shall be at either an expansion joint or at a weakened plane joint. The following provisions shall govern for each type of joint at which the placing of concrete is stopped:

a) When the placing of concrete is stopped at an expansion joint, the complete joint assembly shall be installed and rigidly secured in required position as indicated. A bulkhead of sufficient cross sectional area to prevent deflection, accurately notched to receive the load transmission devices or dowels, as the case may be, and shaped accurately to the cross section of the pavement shall be provided and installed as a back-up for the joint filler and rigidly secured in required position to permit accurate finishing of the concrete up to the joint. After the concrete has been finished to the joint, formation of the joint seal space and finishing of the joint shall be executed as specified herein and as indicated. The backup bulkhead shall remain in place until immediately prior to the time when concrete placement is resumed, then it shall be carefully removed in such manner that no element of the joint assembly will be disturbed. The exposed portion of the joint assembly shall be free of adherent concrete, dirt or other material at the time placing of concrete is resumed.

b) When placing of concrete is stopped at a weakened plane joint, all applicable provisions of paragraph (a) above shall apply in addition to the following requirement:

The face of the bulkhead adjoining the slab end shall be notched and grooved to fit the exposed half section of the joint assembly and shall be shaped to form the slab end at the center of the joint as indicated on

the drawings. The 1/2 width of joint seal space may be formed by a strip of required section placed and removed as indicated for construction of transverse contraction joints. The Contractor shall have available a bulkhead shaped to section of the pavement. This bulkhead must be drilled to permit the continuation of all longitudinal reinforcing steel through the construction joint and shall be of sufficient section and strength to prevent deflection.

c) When load transmission devices are not provided in the design, intentional stopping of placement of concrete shall occur in the middle of a slab. Provisions shall be made to provide a bulkhead, which will accommodate tie bars of the same length, size and spacing as tie bars used for the longitudinal joints. When the concrete placement is resumed, the bulkhead shall be removed without bending tie bars or damaging the concrete. The joint seal space and sealer shall be the same as for longitudinal joints.

Immediately upon the unintended stoppage of the placing of concrete, the Contractor shall place the available concrete to a line and install the above-described bulkhead at right angles to the centerline of the pavement, perpendicular to the surface and at the required elevation. Concrete shall be placed and finished to this bulkhead. Any concrete remaining on the subgrade ahead shall be removed and disposed of as directed by the Engineer or designated representative. When placing of concrete is resumed before the concrete has set to the extent that the concrete will stand on removal of the bulkhead, the new concrete shall be rodded with the first. An edge created by a construction joint of this type shall have a joint seal space and shall be sealed as required for contraction joints.

F. Joint Sealers

1. Class 2 Material

This material shall conform to Standard Specification Item No. 313S, ""Cleaning and/or Sealing Joints and Cracks (Asphaltic Concrete).

For placement in vertical joints (curb faces, etc.) either of the following procedures may be used.

a) An amount of the mixed material may be set aside until partial curing has taken place and carefully trowelled into the joint with a suitable tool.

b) The portion of the joint in the roadway shall be poured and cured. The vertical curb faces shall then be taped or formed and the material poured into the vertical joint from the top.

2. Class 5 Material

This material together with backer rods shall be applied as indicated in accordance with manufacturer's recommendations.

G. Asphalt Board

Premolded materials, wherever used, shall be anchored to the concrete on one side of the joint by means of copper wire or nails not lighter than No. 12 B and S gage. Such anchorage shall be sufficient to overcome the tendency of the material to fall out of the joint. The Contractor shall not contaminate joints to receive Class 5 Joint Material with asphalt from the asphalt board.

H. Curbs

The curb shall be constructed in lengths equal to the adjoining pavement slab lengths and expansion joints shall be provided in the curb opposite each transverse expansion joint in the pavement. Expansion joint material shall be of the same thickness, type and quality as indicated for the pavement and shall be of the section as indicated for the curb. All expansion joints shall be carried through the curb, sidewalk and retaining walls when these items are indicated.

When sawed joints are provided for the pavement, the curb placement shall be delayed until all transverse joints have been sawed. To provide bond for the curb, dowel bars shall be placed as indicated on the drawings, while the pavement concrete is still plastic.

Weakened plane joints shall be formed in monolithic curbs at a spacing to coincide with the joints in the concrete pavement. The joints shall be formed by inserting in the curb an asphaltic board strip cut to conform to the shape of the curb. When the concrete is sufficiently set, the joint on the top and face of curb shall be grooved with an approved type of grooving tool.

A finish coat of mortar shall be applied on the exposed surfaces of the monolithic curbs. The mortar shall be composed of 1 part of Portland Cement and 2 parts of fine aggregate. A mortar coat will not be required for extruded curbs.

The curb face, lower radius and top of curb shall be plastered with the sand-cement mortar. The mortar shall be applied with a template or "mule" made to conform to the curb dimensions as indicated. All exposed surfaces of the curb shall be finished with a steel trowel and brushed to a smooth and uniform surface. The mortar finish as required shall be included in the unit price bid for this item.

I. Machine Finishing

All concrete pavement shall be finished mechanically with approved self-propelled machines, except as herein provided. Hand finishing will be permitted on the transition from a crowned section to a superelevated section without crown on curves, on straight line superelevation sections less than 300 feet (91.4 meters) in length, on that portion of a widened pavement outside normal pavement width and on sections where the pavement width is not uniform, isolated, narrow in width or required monolithic widths are greater than that of available finishing machines.

Machine finishing of pavement shall include the use of power-driven vibrators, power-driven transverse strike off and screed or such alternate equipment as may be substituted and approved under this item.

All concrete pavement shall be consolidated by a mechanical vibrator. As soon as concrete has been spread between the forms, the approved mechanical vibrator

shall be operated to consolidate the concrete and remove all voids. Hand manipulated vibrators shall be used for areas not covered by the mechanical vibratory unit.

The transverse finishing machine shall first be operated to compact and finish pavement to the required section and grade, without surface voids. The machine shall be operated over each area as many times and at such intervals as directed. At least 2 trips will be required and the last trip over a given area shall be a continuous run of not less than 40 feet (12.2 meters). After completion of finishing with the transverse finishing machine, a transverse drag float may be used.

The consistency of the concrete as placed should allow completion of finishing operations without the addition of water to the surface. When field conditions are such that additional moisture is needed for the final concrete surface finishing operation, the required water shall be applied to surface by fog spray only and shall be held to a minimum.

After finishing is complete and the concrete still workable, the surface shall be tested by the Contractor for trueness with an approved 10 foot (3.05 meter) straightedge. The straightedge shall be operated from the side of the pavement, placed parallel to the pavement centerline and passed across the slab to reveal any high spots or depressions. The straightedge shall be advanced along the pavement in successive stages of not more than 1/2 its length. Practically perfect contact of the straightedge with the surface will be required and the pavement shall be leveled to this condition, in order to insure conformity with the surface test required below after the pavement has fully hardened. Any correction of the surface required shall be accomplished by adding concrete if required and by operating the longitudinal float over the area. The surface test with the straightedge shall then be repeated.

For one lane pavement placement and uniform widening, the equipment for machine finishing of concrete pavement shall be as directed by the Engineer or designated representative but shall not exceed requirements of these specifications.

After completion of the straightedge operation, as soon as construction operations permit, texture shall be applied with 1/8 inch (3 mm) wide metal tines with clear spacing between the tines being not less than 1/4 inch (6.3 mm)nor more than 1/2 inch (12.7 mm).

If approved by the Engineer or designated representative, other equipment and methods may be used, provided that a surface texture meeting the specified requirements is obtained. The texture shall be applied transversely. It is the intent that the average depth resulting from the number of tests directed by the Engineer or designated representative be not less than 0.060 inch (1.52 mm) with a minimum texture depth of 0.050 inch (1.27 mm) for any one test when tested in accordance with TxDOT Test Method Tex-436-A. Should the texture depth fall below that intended, the finishing procedures shall be revised to produce the desired texture.

1. Emergency Procedures

The Contractor shall have available at all times hand rakes with tines for the purpose of providing textures in the event of equipment breakdown.

The Contractor also shall have available a conventional garden spray type can containing a commercially available monomolecular film compound. This shall be applied in the case of equipment breakdown or other emergencies to prevent the pavement from drying too rapidly. The use of this product will give the Contractor additional time to provide adequate texturing.

After completion of texturing and about the time the concrete becomes hard, the edge of the slab and joints shall be carefully finished with an edger and the pavement shall be left smooth and true to line.

J. Hand Finishing

Hand finishing shall be resorted to only in those conditions provided for above and upon specific authorization by the Engineer or designated representative. When hand finishing is permitted, concrete shall be struck off with an approved strike off screed to such elevation that when consolidated and finished the surface of the pavement to conform to the required section and grade. The strike template shall be moved forward with a combined transverse and longitudinal motion in the direction work is progressing, maintaining the template in contact with the forms and maintaining a slight excess of material in front of the cutting edge. The Concrete shall then be tamped with an approved tamping template to compact the concrete thoroughly and eliminate surface voids and the surface screed to required section.

After completion of a strike off, consolidation and transverse screeding, a hand-operated longitudinal float shall be operated to test and level the surface to the required grade.

Workers shall operate the float from approved bridges riding on the forms and spanning the pavement. The longitudinal float shall be held in contact with the surface and parallel to the centerline and operated with short longitudinal strokes while being passed from one side of the pavement to the other. If contact with the pavement is not made at all points, additional concrete shall be placed, if required and screed and the float shall be used to produce a satisfactory surface. Care shall be exercised to keep the ends of the float from digging into the surface of the pavement. After a section has been smoothed so that the float maintains contact with the surface at all points in being passed from one side to the other, the bridges may be moved forward half the length of the float and the operations repeated.

Other operations and surface tests shall be as required for machine finishing.

K. Surface Testing:

After the concrete has been placed 12 hours or more, the Engineer or designated representative will test the surface of the pavement with a 10-foot (3.05 meter) straightedge placed parallel to the centerline. Unless specified otherwise, the surface shall not vary from the straightedge by more than 1/16 inch per foot (5 mm per meter) from the nearest point of contact and in no case shall the maximum

ordinate from a straightedge to the pavement be greater than 1/8 inch (3 mm). Any high spots causing a departure from the straightedge in excess of that specified shall be ground down by the Contractor to meet the surface test requirements. Where the texture of the pavement is removed by extensive grinding, the texture shall be restored by grooving the concrete to meet the surface finishing specifications.

L. Curing

All concrete pavement shall be cured by protecting it against loss of moisture for a period of not less than 72 hours from the beginning of the curing operations. Immediately after finishing operations have been completed, the entire surface of the newly laid concrete shall be covered and cured in accordance with the requirements specified for whichever of the following methods the Contractor may elect. Newly laid concrete base to be overlaid by asphaltic concrete shall not be cured by "Membrane Curing" and surfaces not to be overlaid by asphaltic concrete shall not be cured by "Asphalt Curing". In all cases in which curing requires the use of water, the curing shall have prior right to water supply or supplies. Failure to provide sufficient cover material of the type the Contractor elects to use, failure to maintain saturation in wet curing methods, lack of water to adequately take care of both curing and other requirements or other failures to comply with curing requirements shall be cause for immediate suspension of concreting operations. The covering material used in curing shall be removed as necessary to saw joints or to comply with the requirements for "Surface Test". The concrete surface shall be maintained wet with a water spray if indicated and the covering material replaced immediately on completion of sawing and testing and any required surface correction.

1. Waterproofed Paper Curing

Immediately after the finishing of the surface has been completed and the concrete has taken its initial set, it shall be wetted with water applied in the form of a fine spray and covered with waterproofed paper so placed and weighted as to cause it to remain in intimate contact with the surface. Waterproofed paper used for the curing of concrete pavement shall be of a type and quality approved by the Engineer. It shall be sufficiently strong and tough to permit its use under the conditions existing on street paving work without being torn or otherwise rendered unfit for the purpose during the curing period. The paper covering shall be maintained in place continuously for not less than the specified curing period.

The waterproofed paper shall be prepared to form blankets of sufficient width to cover the entire surface and both edges of the pavement slab and such blankets shall not be more than 60 feet in length. All joints in the blankets occasioned by joining paper sheets shall lap not less than 5 inches (12.7 cms) and shall be securely sealed with asphalt cement having a melting point of approximately 180o F (82.2 oC). Blankets shall be placed to secure an overlap of at least 12 inches (30.5 cms) and this lap securely weighted to form a closed joint.

The waterproofed paper blankets shall be adequately weighted to prevent displacement or billowing due to wind and the paper folded down over the

side of the pavement shall be secured by a continuous bank of earth. Plowing of this windrow into place will not be permitted.

All tears or holes appearing in the paper during the curing period shall be immediately repaired by cementing patches over such defects. It shall be the Contractor's responsibility to prevent damage to paper blankets, which would affect their serviceability and effectiveness as a concrete curing method. Blankets may be rejected by the Engineer or designated representative at any time if it appears they do not provide an airtight covering.

Paper blankets rejected on account of pinholes or minor tears may be continued in service by folding the blanket over lengthwise, first thoroughly spraying 1/2 the blanket with the asphalt cement used for seams. The 2 thicknesses shall be firmly pressed together and well cemented. Blankets shall be of a width sufficient to cover the pavement surface and both edges. Doubled blankets may be rejected for the same cause as provided for single blankets. All paper blankets rejected by the

Engineer shall be immediately marked by the Contractor for identification and then destroyed or stored entirely separate from approved blankets.

No walking on paper shall be permitted at any time and, in locations where pedestrian traffic cannot be entirely controlled, the Contractor shall provide walkways and barricades or shall substitute other permissible curing methods on such sections of pavement.

2. Polyethylene Film Curing

Immediately after the finishing of the surface has been completed and the concrete has taken its initial set, it shall be wetted with water applied in the form of a fine spray and covered with the polyethylene film so placed and weighted as to cause it to remain in intimate contact with the surface. The polyethylene film covering shall be maintained in place continuously for not less than the specified curing period.

The film shall be prepared to form blankets of sufficient width to cover the entire surface and both edges of the pavement slab. All joints in the blankets occasioned by joining film sheets shall lap not less than 12 inches (30.5 cms). All joints shall be sealed in a manner acceptable to the Engineer or designated representative to provide a moisture-proof lap.

The polyethylene film blankets shall be adequately weighted to prevent displacement or billowing due to wind and the film folded down over the side of the pavement shall be secured by a continuous bank of earth. Plowing of this windrow into place not to be permitted.

All tears or holes appearing in the polyethylene film during the curing period shall be immediately repaired by placing acceptable moisture proof patches over such defects or by replacing the blankets. It shall be the Contractor's responsibility to prevent damage to the film blankets, which would affect their serviceability and effectiveness as a concrete curing method. Blankets may be rejected by the Engineer at any time if it appears they do not provide an airtight covering.

Polyethylene film blankets rejected on account of pinholes or minor tears may be continued in service when repaired to an airtight condition. All polyethylene film blankets rejected by the Engineer or designated representative shall be immediately marked by the Contractor for identification and then destroyed or stored entirely separate from approved blankets.

Should the film blanket be damaged or torn for any cause during the first 72 hours of the curing period such damage shall be repaired immediately.

3. Membrane Curing

Immediately after the finishing of pavement has been completed and after the free surface moisture has disappeared, the pavement shall be sprayed uniformly with a curing compound. Membrane curing shall conform to Standard Specification Item No. 409S, "Membrane Curing", Type 2 white pigmented. Should the film of compound be damaged from any cause before the expiration of 72 hours after original application, the damaged portions shall be repaired with additional compound. Unless otherwise indicated on the drawings, membrane curing shall be used when the concrete (except that concrete to be used as a base) is placed with a slip form paver.

4. Asphalt Curing

Where emulsified asphalt is used for curing concrete base, the material shall conform to Item No. 301S, "Asphalts, Oils and Emulsions", for the type and grade shown on the drawings. The rate of application may vary between the limits of 1 gallon per 180 square feet and 1 gallon per 90 square feet (1 liter per 4.4 square meters and 1 liter per 2.2 square meters). The rate of application will be determined by the Engineer or designated representative, after observation of sections where amounts varying between the above limits have been applied. If it is found necessary to add water to the emulsion for the proper distribution through the spray, this may be done upon approval of the Engineer or designated representative. When the emulsion is diluted with water the amount of the applied mixture shall be increased to give a coverage of the original emulsion between the limits as set out herein. Care shall be taken to properly mix the emulsion and water and to keep the mixture well agitated during application.

M. Protection of Pavement

The Contractor shall erect and maintain the barricades indicated on the drawings and such other standard and approved devices as will exclude public traffic and traffic of the Contractor's employees and agents from the newly placed pavement for a minimum of 14 days. Portions of the roadway or crossings of the roadbed required to be maintained open for use by traffic shall not be obstructed by above required barricades. Crossings of the pavement indicated on the drawings or by construction sequence, during the period prior to opening to traffic as herein indicated, shall be provided with an adequate and substantial bridge approved by the Engineer or designated representative.

Curb shall be backfilled to the full height of the concrete, tamped and sloped as indicated on the drawings or as directed by the Engineer. The top 4 inches (10

cms) of backfill shall be of clean, friable soil capable of supporting plant life. This material shall also be free of stones and all other debris.

N. Opening Pavement to Traffic

The pavement shall be closed to traffic, including vehicles of the Contractor, until the concrete is at least 14 days old and has attained an average compressive strength acceptable to the Engineer or designated representative. This period of closure to traffic may be extended if, in the opinion of the Engineer or designated representative, weather or other conditions make it advisable to provide an extension of the time of protection.

At the end of the 14 day period and as long thereafter as ordered by the Engineer or designated representative and if so desired by the Contractor, the pavement may be opened for use by vehicles of the Contractor provided the gross weight (vehicle plus load) of such vehicles does not exceed 14,000 pounds (6350 KGs). Such opening, however, shall in no manner relieve the Contractor from responsibility for the Contractor's work. On those sections of the pavement thus opened to traffic, all joints shall first be sealed, the pavement cleaned and topsoil placed against the pavement edges or behind the curb where turf or vegetation is to be established before permitting vehicles thereon.

After the concrete in any section is 14 days old or as long thereafter as ordered by the Engineer, such section of pavement may be opened to all traffic indicated on the drawings or when so directed by the Engineer or designated representative. On those sections of the pavement thus opened to traffic, all joints shall first be sealed, the pavement cleaned and 4 inches (10 cms) of top soil placed against the pavement edges and all other work performed as required for the safety of traffic. Such opening, however, shall in no manner relieve the Contractor from responsibility for the Contractor's work.

When High Early Strength Concrete, resulting from the use of Type III cement as indicated on the drawings is used, the pavement may be opened to all traffic after the concrete is 7 days old or as long thereafter as ordered by the Engineer or designated representative, subject to the same provisions governing the opening after 14 days as above indicated.

Where the Contractor desires to move any equipment not licensed for operation on public streets, on or across any pavement opened to traffic, the Contractor shall protect the pavement from damage by means of 2 ply timber mats of 2 inch (5 cm) stock or runways of heavier material laid on a layer of earth, all as approved by the Engineer or designated representative.

1. Emergency Opening to Traffic

The Engineer or designated representative may require the opening of pavement to traffic prior to the minimum time specified above under conditions of emergency, which in the Engineer's or designated representative's opinion require such action in the interest of the public. In no case will the Engineer or designated representative order opening of the pavement to traffic within less than 72 hours after the last concrete in the section is placed. The Contractor shall remove all obstructing materials, place earth against pavement edges and perform other work involved in

providing for the safety of traffic as required by the Engineer or designated representative in ordering emergency opening. Orders for emergency opening of the pavement to traffic will be issued by the Engineer or designated representative in writing.

**360S.8 Penalty for Deficient Pavement Thickness or Strength**

The adjustment in unit prices provided for in this item will apply only when measurement for payment is by the square yard.

It is the intent of this specification that the pavement be constructed in strict conformity with the thickness, strength and typical sections indicated on the drawings. Where any pavement is found not so constructed, the following rules relative to adjustment of payment for acceptable pavement and to replacement of faulty pavement shall govern.

A. Pavement

The pavement will be core drilled after any grinding operations have been completed for surface corrections prior to final acceptance. Locations of core tests may be selected by the Engineer or designated representative; however, spacing interval for core tests, as specified herein, shall be maintained. The thickness of the pavement will be determined by measurement of the cores in accordance with TxDOT Test Method Tex-424-A.

For the purpose of establishing an adjusted unit price for pavement, units to be considered separately are defined as 1000 linear feet of pavement in each traffic lane starting at the end of the pavement bearing the smaller station number. The last unit in each lane shall be 1000 feet plus the fractional part of 1000 feet remaining. Traffic lane width will be as shown on typical sections and pavement design standards.

For the purpose of establishing an adjusted unit price for ramps, widening, acceleration and deceleration lanes that are machine placed, isolated pavements of traffic lane width but less than 1000 feet in length and other areas designated by the Engineer or designated representative, units will be considered separately and are defined as 1000 square yards of pavement or fraction thereof.

One core will be taken at the location selected by the Engineer or designated representative or at random in each unit. When the measurement of the core from any unit is not deficient more than 0.2 inches from the plan thickness, full payment will be made. When the measurement of the core from any unit is deficient more than 0.2 inch but not more than 0.75 inch from the plan thickness, 2 additional cores will be taken from the unit and the average of the 3 cores determined. The 2 additional cores from any 1000-foot unit will be taken at intervals of not less than 300 feet. The 2 additional cores from any 1000 square yard unit will be taken at locations such that the pavement in the unit will be well represented. If the average measurement of these 3 cores is not deficient more than 0.2 inches from the plan thickness, full payment will be made. If the average thickness of the 3 cores is deficient by more than 0.2 inch but not more than 0.75 inch from the

indicated thickness, an adjusted unit price as provided below will be paid for the areas represented by these cores.

In calculating the average thickness of the pavement, measurements which are in excess of the specified thickness by more than 0.2 inch will be considered as the specified thickness plus 0.2 inch and measurements which are less than the specified thickness by more than 0.75 inch will be considered as the specified thickness less 0.75 inch.

When the measurement of any core is less than the specified thickness by more than 0.75 inch, the actual thickness of pavement in this area will be determined by taking additional cores at 10 foot intervals parallel to the center line in each direction from the deficient core until, in each direction, a core is taken which is not deficient by more than 0.75 inch. Exploratory cores for deficient thickness will not be used in averages for adjusted unit price. Exploratory cores are to be used only to determine the length of pavement in a unit that is to be left in place without pay and/or removed and replaced as provided herein.

For new Concrete Pavement roadways, and for Concrete Pavement rehabilitation and overlay projects, if cracks develop in the pavement surface within the one year warranty period, the Contractor shall seal the cracks in accordance Standard Specification Item No. 313S, “Cleaning and/or Sealing Joints and Cracks (Asphaltic Concrete), or perform other corrective measures as directed by the Engineer. Payment for this work will be included in the unit price bid for Concrete Pavement, unless included as a separate pay item in the Contract.

For new Concrete Pavement roadways constructed in accordance with the plans and specifications, if cracks greater than or equal to 1/4 inch in width develop in the pavement surface within the one year warranty period, complete replacement of pavement sections as directed by the Engineer shall be performed by the Contractor at no additional expense to the City.

Irrespective of an acceptable overall project average for any or all of the Pay-Adjustment Acceptance Factors, limited substandard portions of the work, as determined by the Engineer or designated representative, shall be remedied or removed and replaced to the satisfaction thereof.

B. Price Adjustments

After any grinding or milling operations have been completed to meet the surface-testing requirement of this specification, if average thickness of pavement is deficient in thickness by more than 0.2 inch, but not more than 0.75 inch, payment will be made at an adjusted price as specified in the following table:

| Concrete Pavement Deficiency | |
|---|---|
| Deficiency in Thickness Determined by Cores, Inches | Proportional Part of Contract Price Allowed |

| | |
|---|---|
| 0.00 to 0.20 | 100 percent |
| 0.21 to 0.30 | 80 percent |
| 0.31 to 0.40 | 72 percent |
| 0.41 to 0.50 | 68 percent |
| 0.51 to 0.75 | 57 percent |

Any area of pavement found deficient in thickness by more than 0.75 inch but not more than 1 inch or 1/8 of the indicated thickness, whichever is greater, shall be evaluated by the Engineer. If, in the judgment of the Engineer, the area of such deficiency should not be removed and replaced, there will be no payment for the area retained. If, in the judgment of the Engineer, the area of such deficiency warrants removal, the area shall be removed and replaced at the Contractor's entire expense, with concrete of the thickness indicated on the drawings.

Any area of pavement found deficient in thickness by more than 1 inch or more than 1/8 of the indicated thickness, whichever is greater, shall be removed and replaced, at the Contractor's entire expense, with concrete of the thickness indicated on the drawings.

No additional payment over the Contract unit price will be made for any pavement of a thickness exceeding that indicated on the drawings.

If the average compressive strength based on concrete test cylinders at 28 days is less than the specified minimum strength of the concrete, then payment will be made at an adjusted price as specified in the following table.

| Pay Adjustment Factor for Deficient Compressive Strength | |
|---|---|
| Ratio of Average Strength from Test Cylinders to Specified Minimum Compressive Strength both at 28 Days | Proportional Part of Contract Price Allowed |
| More then 0.95 | 100 percent |
| 0.90 to 0.95 | 85 percent |
| 0.85 to 0.90 | 70 percent |
| 0.80 to 0.85 | 60 percent |
| Less than 0.80 | 0 percent (Remove & Replace) |

When, in the opinion of the Engineer or designated representative, the compressive strength test results appear unrepresentative, additional testing of field cores may be authorized. To be considered acceptable for consideration the

field cores shall be acquired, properly handled and tested in accordance with ASTM C 42/C 42M, "Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete" within 45 days of the original concrete placement date. The retesting will be at the expense of the Contractor and the results of the retesting shall be averaged with the results of the original testing. If the results of retesting indicate that the original test results were erroneous in the opinion of the Engineer or designated representative, the original test results will be discarded. In the instance of erroneous original test results the subsequent first set of retests will be at the expense of the City of Austin.

When, in the opinion of the Engineer or designated representative, the concrete compressive strength is deemed unacceptable for the intended use of the pavement, the concrete shall be removed and replaced to the limits indicated by test results.

**360S.9 Measurement**

A. When indicated, concrete pavement will be measured by the square yard of surface area of completed and accepted work. The surface area shall be so measured to also include that portion of pavement slab extending beneath the curb. When concrete pavement is to be measured by the square yard and monolithic curb is required, measurements for "Monolithic Curb" will be by the linear foot complete in place.

B. When indicated on the drawing, concrete pavement, including monolithic curb when required, will be measured by the cubic yard of absolute volume of materials entering the mixture.

**360S.10 Payment**

The work performed and materials furnished as prescribed by this item and measured as provided under "Measurement" will be paid for at the unit price bid for "Concrete Pavement", of the depth indicated on the drawings, "Concrete Pavement (High Early Strength)" of the depth indicated on the drawings and "Monolithic Curb" of the type indicated on the drawings (when pavement is measured by the square yard), as required or adjusted unit price for pavement of deficient thickness as provided under "Deficient Pavement Thickness", which price shall be full compensation for shaping and fine grading the roadbed, including furnishing and applying all water required; for furnishing, loading and unloading, storing, hauling and handling all concrete ingredients, including all freight and royalty involved; for placing and adjusting forms, including supporting material or preparing track grade; for mixing, placing, finishing, sawing, cleaning and sealing joints and curing all concrete; for furnishing and installing all reinforcing steel; for furnishing all materials for sealing joints and placing longitudinal, expansion and weakened plane joints, including all steel dowel caps and load transmission devices required and wire and devices for placing, holding and supporting steel bars, load transmission devices and joint filler material in proper position, for coating steel bars where complete the work.

Excavation required by this item in the preparation of the subgrade and for completion of the parkway will be measured and paid for in accordance with provisions governing the Items of "Street Excavation" and "Borrow", respectively, with provision that yardage to be measured and paid for once only, regardless of manipulations involved. Measurement of subgrade excavation for payment shall be limited to a total width of that of pavement plus 1 foot on each side.

Sprinkling and rolling required for the compaction of the rough subgrade in advance of fine grading will be measured and paid for as indicated in the governing items of excavation. Maintenance of a moist condition of the subgrade in advance of fine grading and concrete placing will not be paid for directly but shall be included in the unit price bid, as provided above.

Payment will be made under one of the following:

| | | | |
|---|---|---|---|
| Pay Item No. | 360S-A: | __In. Concrete Pavement | Per Square Yard. |
| Pay Item No. | 360S-AH: | __In. Concrete Pavement (High Early Strength) | Per Square Yard. |
| Pay Item No. | 360S-AS: | __In. Concrete Pavement (High Range Water Reducing Admixture) | Per Square Yard. |
| Pay Item No. | 360S-B: | Monolithic Curb | Per Linear Foot. |
| Pay Item No. | 360S-C: | __Concrete Pavement Including Monolithic Curb | Per Cubic Yard. |

**End**

| SPECIFIC CROSS REFERENCE MATERIALS |
| --- |
| **Standard Specification Item 360S, "Concrete Pavement"** |

City of Austin Standard Specification Items

| Designation | Description |
| --- | --- |
| Item No. 301S | Asphalts, Oils and Emulsions |
| Item No. 313S | Cleaning and/or Sealing Joints and Cracks (Asphaltic Concrete) |
| Item No. 403S | Concrete for Structures |
| Item No. 405S | Concrete Admixtures |
| Item No. 410S | Concrete Structures |
| Item No. 411S | Surface Finishes for Concrete |
| Item No. 413S | Cleaning and/or Sealing Joints and Cracks (PCC) |

American Society for Testing and Materials, ASTM

| Designation | Description |
| --- | --- |
| ASTM C 42/C 42M | Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete" |
| ASTM A 82 | Specification for Steel Wire, Plain, for Concrete Reinforcement |
| ASTM A 184 | Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement |
| ASTM A 185 | Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement |
| ASTM A 496 | Specification for Steel Wire, Deformed, for Concrete Reinforcement |
| ASTM A 497 | Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement |

ASTM A 615 Specification for Deformed and Plain Billet-Steel Bars, for Concrete Reinforcement

ASTM A 616 Specification Rail-Steel Deformed and Plain Bars for Concrete Reinforcement

ASTM C 94 Specification for Ready-Mixed Concrete

ASTM C 150 Specification for Portland Cement

ASTM C 156 Test Method for Water Retention by Concrete Curing Materials

ASTM D 2240 Test Method for Rubber Property-Durameter Hardness

ASTM D 882, Method A Test Methods for Tensile Properties of Thin Plastic Sheeting

Texas Department of Transportation: Publications

| Designation | Description |
|---|---|
| Bulletin C-11 | Construction Bulletin |

Texas Department of Transportation: Manual of Testing Procedures

| Designation | Description |
|---|---|
| TEX-203-F | Sand Equivalent Test |
| TEX-401-A | Sieve Analysis of Fine and Coarse Aggregate |
| TEX-406-A | Mineral Finer than 75 µm (No. 200) Sieve in Mineral Aggregates (Decantation Test for Concrete Aggregates) |
| TEX-408-A | Organic Impurities in Fine Aggregate for Concrete |
| TEX-410-A | Abrasion of Coarse Aggregate Using The Los Angeles Machine |
| TEX-411-A | Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate |
| TEX-413-A | Determination of Deleterious Materials in Mineral Aggregate |

| | |
|---|---|
| TEX-415-A | Slump of Portland Cement Concrete |
| TEX-416-A | Air Content of Freshly-Mixed Concrete by the Pressure Method |
| Tex-424-A | Obtaining and Testing Drilled Cores of Concrete |
| Tex-436-A | Measurement of Texture Depth by the Sand Patch Method |
| Tex 418-A | Compressive Strength of Cylindrical Concrete |
| Tex-524-C | Testing Premolded Joint Filler for Concrete |
| Tex-612 | Acid Insoluble Residue |

Texas Department of Transportation: Departmental Material Specifications

| Designation | Description |
|---|---|
| DMS 8900 | Fly Ash |

American Association of State Highway & Transportation Officials, AASHTO Standard

| Designation | Description |
|---|---|
| Method T 26 | Quality of Water to be Used in Concrete |

| RELATED CROSS REFERENCE MATERIALS |
|---|
| **Standard Specification Item 360S, "Concrete Pavement"** |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item 360 | Concrete Pavement |
| Item 420 | Concrete Structures |

| | |
|---|---|
| Item 421 | Hydraulic Cement Concrete |
| Item 427 | Surface Finishes for Concrete |
| Item 431 | Pneumatically Placed Concrete |
| Item 520 | Weighing and Measuring Equipment |

Texas Department of Transportation: Departmental Material Specifications

| Designation | Description |
|---|---|
| DMS-4650 | Hydraulic Cement Concrete Curing Materials and Evaporation Retardants" |
| DMS-6100 | Epoxy and Adhesives |

American Society for Testing and Materials, ASTM

| Designation | Description |
|---|---|
| ASTM C 685 | Concrete Made By Volumetric Batching and Continuous Mixing |
| ASTM C-1260 | Standard Test Method for Potential Alkali Reactivity of Aggregates |
| ASTM D-512 | Test Methods for Chloride Ion in Water |
| ASTM D-516 | Test Methods for Sulfate Ion in Water |
| ASTM D-4191 | Test Method for Sodium in Water by Atomic Absorption |
| ASTM D-4192 | Test Method for Potassium Water by Atomic Absorption |

American Concrete Institute, ACI

| Designation | Description |
|---|---|
| ACI 211.1 | Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete |

Texas Department of Transportation: Manual of Testing Procedures

| Designation | Description |
|---|---|
| TEX-418-A | Compressive Strength of Cylindrical Concrete Specimens |

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**Item No. 401S**
**Structural Excavation and Backfill**

## 401S.1 Description

This item shall govern the excavation for placement of structures, except pipe sewers, the disposal of such excavated material and the backfill around completed structures to the level of the original ground or grade indicated on the Drawings. The work shall include all necessary pumping or bailing, sheathing, drainage, and the construction and removal of any required cofferdams. Unless otherwise indicated on the Drawings, the work included hereunder shall provide for the removal of old structures or portions thereof (abutments, buildings, foundations, wingwalls, piers, etc.), trees and all other obstructions necessary to the proposed construction.

Where excavation is not classified, it will be grouped under "Unclassified Structural Excavation", which shall include the removal of all materials encountered regardless of their nature or the manner in which they are removed.

Where excavation is classified, it shall be classed as "Common Structural Excavation" or "Rock Structural Excavation" in accordance with the following criteria:

"Common Structural Excavation" shall include the removal of all materials other than rock.

"Rock Structural Excavation" shall include the removal of firm and compact materials that cannot be excavated with power equipment, without first being loosened or broken by blasting, sledging or drilling.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

## 401S.2 Submittals

The submittal requirements of this specification item may include:

Supplier and certified test results for fine aggregate/sand material

Supplier and certified test results for flexible base material

Mix design and test results for lime stabilized subgrade material

Mix design and test results for Class J Concrete Base

Supplier and certified test results for granular material (coarse aggregate, foundation rock and pea gravel)

Mix design and test results for cement-stabilized backfill

Mix design and test results for controlled low strength material (CLSM)

Excavation Safety System Plan for proposed cofferdams, trench excavation and special shoring installations

**401S.3 Materials**

A. Sand

1. Fine aggregate sand shall be Grade 1 conforming to Standard Specification Item No. 302S, "Aggregates for Surface Treatments".

2. Native Sand shall be local material obtained from approved sources and subject to the approval of the Engineer or designated representative.

B. Flexible Base

Flexible base shall conform to the requirements of Standard Specification Item No. 210S, "Flexible Base".

C. Lime Stabilized Base

Lime stabilized base shall conform to the requirements of Standard Specification Item No. 202S, "Hydrated Lime and Lime Slurry" and Item No. 203S, "Lime Treatment for Materials in Place".

D. Concrete Base

Concrete base shall conform to a Class J Concrete as defined in Standard Specification Item No. 403S, "Concrete for Structures".

E. Granular Material

1. Coarse aggregate shall conform to the requirements of section 403S.3.C of Standard Specification Item No. 403S "Concrete for Structures".

2. Foundation Rock

Foundation rock shall be well graded, hard, durable coarse aggregate ranging in size from 2 to 6 inches (50 to 150 mm).

3. Pea Gravel

Pea gravel shall consist of hard, durable, opaque gravel, free of clay, loam, sand or other foreign substances, ranging in size from 1/4 inch to 3/8 inch (6.4 to 9.5 mm) conforming to ASTM C 33.

F. Cement Stabilized Backfill

Cement stabilized backfill shall contain aggregate, water and a minimum of 7% hydraulic cement based on the dry weight of the aggregate in accordance with TxDoT Test Method Tex-120-E, “Soil-Cement Testing". Unless directed otherwise

on the Drawings, the aggregate shall be clean sand approved by the Engineer or designated representative.

G. Controlled Low Strength Material

Controlled low strength material (CLSM) shall conform to Standard Specification Item No. 402S, "Controlled Low Strength Material" and shall be approved by the Engineer or designated representative.

## 401S.4 Construction Methods

A. Erosion Control and Tree Protection

Prior to commencement of this work, all required erosion control and tree protection measures indicated on the Drawings shall be in place. The existing utilities shall be located and protected as specified in the Standard Contract Documents, Section 00700, "General Conditions" and/or indicated on the Drawings. A permit shall be required when utility adjustments are to be made in preparation for construction in the right-of-way, as specified in Section 5.2.0 of the City of Austin Utilities Criteria Manual.

Areas within the construction limits indicated on the Drawings shall be cleared of all trees, stumps, brush, etc., except trees or shrubs scheduled for preservation which shall be carefully trimmed as directed by the Engineer or designated representative, in accordance with Standard Specification Item No. 610S, " Preservation of Trees and Other Vegetation" and shall be protected from scarring, barking or other injuries during construction operations. All exposed cuts over 2 inches (50 millimeters) in diameter, exposed ends of pruned limbs or scarred bark shall be treated with an approved asphalt material within 24 hours of the pruning or injury.

Construction equipment shall not be operated nor construction materials stockpiled under the canopies of trees, unless otherwise indicated on the Drawings and/or specified in the Contract Documents. Excavation or embankment materials shall not be placed within the drip line of trees until tree wells are constructed.

Within the construction limits or areas indicated, all obstructions, stumps, roots, vegetation, abandoned structures, rubbish and objectionable material shall be removed to the following depths:

1. In areas to receive 6 inches (150 mm) or more embankment, a minimum of 12 inches (300 mm) below natural ground.

2. In areas to receive embankment less than 6 inches (150 mm), a minimum of 18 inches (450 mm) below the lower elevation of embankment, structure or excavation.

3. In areas to be excavated a minimum of 18 inches (450 mm) below the lower elevation of the embankment, structure or excavation.

4. In all other areas a minimum of 12 inches (300 mm) below natural ground.

When abandoned storm drains, sewers or other drainage systems are encountered they shall be removed as required to clear the new structure and plugged in a manner approved by the Engineer or designated representative.

Holes remaining after removal of all obstructions, objectionable material, trees, stumps, etc. shall be backfilled with select embankment material and compacted by approved methods. All cleared and grubbed material shall be disposed of in a manner satisfactory to the Engineer or designated representative. Unless otherwise provided, all materials as described above shall become the property of the Contractor and removed from the site and disposed of at a permitted disposal site.

Burning materials at the site shall conform to Standard Contract Document Section 01550, "Public Safety and Convenience".

B. Excavation

1. Excavation shall be done in accordance with the lines and depths indicated on the Drawings or as established by the Engineer or designated representative. Unless otherwise indicated on the Drawings or permitted by the Engineer or designated representative no excavation shall be made outside a vertical plane 3 feet (0.9 meter) from the footing lines and parallel thereto.

   When structures are installed in streets, highways or other paved areas, the pavement and base shall be cut to neat lines. After completion of the excavation and backfilling, the pavement structure shall be restored to the satisfaction of the Engineer or designated representative.

2. Slopes, benching, sheeting, bracing, pumping and bailing shall be provided as necessary to maintain the stability and safety of excavations up to 5 feet (1.5 meters) deep. Excavation protection for excavations deeper than 5 feet (1.5 meters) shall be governed by Standard Specification Item No. 509S, "Excavation Safety Systems".

3. Excavation shall conform to elevations indicated on the Drawing or raised or lowered by written order of the Engineer or designated representative, when such alterations are judged proper. When it is deemed necessary to increase or decrease the plan depth of footings, the alterations in the details of the structure shall be as directed by the Engineer or designated representative. The Engineer or designated representative shall have the right to substitute revised details resulting from consideration of changes in the design conditions.

4. When a structure is to rest on an excavated surface other than rock, special care shall be taken not to disturb the bottom of the excavation and the final excavation to grade shall not be performed until just before the footing is placed. Equipment selected and used by the Contractor for excavation which results in disturbance of what was otherwise stable subgrade material, as shown by laboratory tests, will not be used as a justification for payment for excavating to extra depth or for payment for stabilizing materials which may be ordered by the Engineer or designated representative.

5. Excavated material required to be used for backfill may be deposited by the Contractor in storage piles as indicated on the Drawing or at points convenient for its rehandling during the backfilling operations, subject to the approval of the Engineer or designated representative, who may require that the survey center line of the structure and the transverse or hub line of any unit of the structure be kept free of any obstruction. The Contractor shall adjust any stockpiles, to facilitate surveying and the work of other Contractors working in the immediate proximity, as directed by the Engineer or designated representative.

6. Excavated material required to be wasted shall be disposed of as directed by the Engineer or designated representative, in a manner which will not obstruct the stream or otherwise impair the efficiency or appearance of the structure or other part of the work.

7. For all single and multiple box culverts, pipe culverts, pipe arch culverts and box sewers of all types, where the soil encountered at established footing grade is a quicksand, muck or similar unstable material, the following procedure shall be used unless other methods are indicated:

   a) The depth to which unstable material is removed will be determined by the Engineer or designated representative. It will not exceed 2 feet (0.6 meter) below the footing of culverts that are 2 feet (0.6 meter) or more in height and will not exceed the height of culverts for those less than 2 feet (0.6 meter) high. Excavation shall be carried at least 1 foot (0.3 meter) horizontally beyond the limits of the structure on all sides. All unstable soil removed shall be replaced with suitable stable material, in uniform layers of suitable depth for compaction as directed by the Engineer or designated representative. Each layer shall be wetted, if necessary and compacted by rolling or tamping as required to provide a stable foundation for the structure. Soil, which has sufficient stability to properly sustain the adjacent sections of the roadway embankment, will be considered a suitable foundation material.

   b) When, in the opinion of the Engineer or designated representative, it is not feasible to construct a stable footing as outlined above, the Contractor shall construct it by the use of special materials, such as flexible base, cement stabilized base, cement stabilized rockfill or other material, as directed by the Engineer or designated representative. This work will be paid for as provided in Section 401S.9, " Payment".

8. When the material encountered at footing grade of a culvert is found to be partially rock or incompressible material and partially a compressible soil which is satisfactory for the foundation, the incompressible material shall be removed for a depth of 6 inches (150 mm) below the footing grade and backfilled with a compressible material similar to that used for the rest of the structure.

9. When the material encountered at footing grade of a bridge bent or pier is found to be partially of rock or incompressible material, and partially of a compressible material, the foundation shall not be placed until the Engineer

or designated representative has inspected the footing and authorized such changes found necessary to provide an adequate foundation.

**401S.5 Bridge Foundations and Retaining Walls**

The material below the bottom of the footing grade shall not be disturbed. Backfill material shall not be used to compensate for excavation that is extended below the proposed footing grade. When excavation is carried below the proposed footing grade, the over excavated area shall be filled with concrete at the time the footing is placed. The additional concrete placement shall be at the Contractor's sole expense.

When required by the Engineer or designated representative, cores shall be taken to determine the character of the supporting material(s). The cores shall be taken when the excavation is nearing completion and shall be an intact sample adequate to judge the character of the founding material. The cores shall be acquired at a minimum depth of 5 feet (1.5 meters) below the proposed footing founding grade.

When the founding stratum is rock or other hard material, all loose material shall be removed and the founding grade cleaned and cut to a firm surface that is level, stepped or serrated as directed by the Engineer or designated representative. All soft seams shall be cleaned and filled with concrete at the time the footing is placed.

When the material at the footing grade of a retaining wall, bridge bent or pier is a mixture of compressible and incompressible material, the foundation shall not be placed until the Engineer or designated representative has inspected the excavation and authorized changes to provide a uniform bearing condition.

**401S.6 Cofferdams**

The term cofferdams, whenever used in this specification, designates any temporary or removable structure constructed to hold the surrounding earth, water or both, out of the excavation, whether the structure is formed of earth, timber, steel, concrete or a combination of these. It includes earthen dikes, timber cribs, any type of sheet piling, removable steel shells and the like and all necessary bracing and it shall be understood also to include the use of pumping wells or well points for de-watering. The cost of cofferdams, when required, shall be included as a part of the bid price for excavation.

It is the intent of this specification to require that a suitable cofferdam be provided, when necessary, to insure that the foundation may be placed in a dry condition, as to preclude sliding and caving of the walls of the excavation. The cofferdam shall conform with the requirements of Standard Specification Item No. 509S, "Excavation Safety Systems" and shall provide a safe work area with sufficient clearance for the construction, inspection and removal of required forms and, if necessary, sufficient room to allow pumping outside the forms. Where no ground or surface water is encountered, the cofferdam need be sufficient only to protect the workmen and to avoid cave-ins or slides beyond the excavation limits.

Unless otherwise indicated on the Drawings, cofferdams shall be removed by the Contractor after the completion of the substructure without disturbing or marring the structure.

**401S.7 De-Watering**

Structures shall not be constructed or placed in the presence of water unless otherwise approved by the Engineer or designated representative. Precast members, pipe and concrete shall only be placed on a dry, firm surface. Water shall be removed by bailing, pumping, well-point installation, deep wells, underdrains or other approved method.

When structures are approved for placement in the presence of water, standing water shall be removed in a manner that shall preclude the possibility of the movement of water through or alongside any concrete being placed. Pumping or bailing will not be permitted during the placing of concrete or for a period of at least 36 hours thereafter, unless from a suitable sump separated from the concrete work by a water-tight wall.

Pumping or bailing during placement of seal concrete shall only be allowed to the extent necessary to maintain a static head of water within the cofferdam. De-watering inside a sealed cofferdam shall not commence until the seal has aged a minimum of 36 hours.

When the bottom of an excavation cannot be de-watered to the point that the subgrade is free of mud or it is difficult to keep the reinforcing steel clean a stabilizing material (e.g. flexible base, cement-stabilized-backfill or lean concrete) shall be placed in the bottom of the excavation. When a lean concrete is used, the concrete shall include a minimum of 275 Pounds of cement per cubic yard (163 kilograms of cement per cubic meter) and be placed to a minimum depth of 3 inches (75 mm). Stabilizing material that is placed for the convenience of the Contractor will be at the Contractor's own expense.

**401S.8 Backfilling**

A. General

As soon as practicable, all portions of excavation not occupied by the permanent structure shall be backfilled. Back-fill material shall be free from stones large enough to interfere with compaction, large or frozen lumps that will not break down readily under compaction, wood or other extraneous material. Backfill material shall be approved by the Engineer or designated representative.

That portion of backfill which will support any portion of completed roadbed, retaining wall or embankment shall be placed in layers not more than 8 inches (200 mm) in depth (loose measurement) and shall be compacted to meet the density requirements of the roadbed, retaining wall, embankment material, or as indicated on the Drawings.

That portion of backfill which will not support any portion of completed roadbed or embankment shall be placed in layers not more than 10 inches (250 mm) in depth (loose measurement) and shall be compacted to a minimum of 95 percent of

maximum density as determined by TxDoT Test Method Tex-114-E and the re-excavated to the proper grade and dimensions.

If the excavation has been made through a hard material resistant to erosion, the backfill around piers and in front of abutments and wings may be ordered by the Engineer or designated representative to be of stone or lean concrete. Unless otherwise indicated on the Drawings, such backfill shall be paid for as extra work.

That portion of the backfill which will support any portion of the roadbed, retaining wall or embankment shall be placed in uniform layers not more than 8 inches (200 mm) in depth (loose measurement) and shall be 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 wetted uniformly to the moisture content required to obtain the specified density and shall be compacted to that density by means of mechanical tampers or rammers, except that the use of rolling equipment of the type generally used in compaction embankments will be permitted on portions which are accessible to such equipment.

All portions of embankment too close to any portion of a structure to permit compaction by the use of the blading and rolling equipment used on adjoining sections of embankment, shall be placed and compacted with mechanical tamps and rammers to avoid damage to the structure.

These provisions require mechanical compaction by means of either rolling equipment or mechanical tampers or rammers, of all backfill and embankment adjoining the barrels and wingwalls or culverts and adjoining all sides of bridge abutments and retaining walls, regardless of whether or not such embankment or backfill is above or below the original surface of the ground and regardless of whether the excavation at structure site was performed conforming to Standard Specification Item No.111S, "Excavation", this item 401S, "Structural Excavation", Standard Specification Item No. 110S, "Street Excavation" or Standard Specification Item No. 120S, "Channel Excavation". Unless otherwise indicated on the Drawings, hand tamping will not be accepted as an alternate for mechanical compaction.

As a general rule, material used in filling or backfilling the portions described in this paragraph shall be an earth, free of any appreciable amount of gravel or stone particles larger than 4 inches (100 mm) in greater dimension and of a gradation that permits thorough compaction. When, in the opinion of the Engineer or designated representative, such material is not readily available, the use of rock or gravel mixed with earth will be permitted, provided that no particles larger than 12 inches (300 mm) or smaller than 6 inches (150 mm) may be used. The percentage of fines shall be sufficient to fill all voids and insure a uniform and thoroughly compacted mass of proper density. When required by the Drawings or by written order of the Engineer or designated representative, cement-stabilized-backfill material shall be used for backfilling.

All portions of fill and backfill described in the preceding paragraph shall be compacted to the same density requirements specified for the adjoining sections of embankment in accordance with the governing specifications. Where no embankment is involved on the project and no relevant specifications are included in the contract, all backfill shall be compacted to a density comparable with the adjacent undisturbed material.

No backfill shall be placed against any abutment or retaining wall until such structure has been in place at least 7 days. No backfill shall be placed adjacent to or over single and multiple boxes until the top slab has attained 500 psi (3450 kPa) flexural strength. Backfill placed around abutments and piers shall be deposited on both sides to approximately the same elevation at the same time.

Care shall be taken to prevent any wedging action of backfill against the structure and the slopes bounding the excavation shall be stepped or serrated to prevent such action. Backfill shall be uniformly placed around bridge foundations.

B. Pipe Culverts

The following requirements shall apply to the backfilling of pipe culverts in addition to the pertinent portions of the general requirements given in the preceding section.

Selected materials from excavation, borrow or other approved material shall be wetted, if required and placed along both sides of the pipe equally, in uniform layers not exceeding 8 inches (200 mm) in depth (loose measurement) and thoroughly compacted so that there shall be a berm of thoroughly compacted material on each side of the pipe. The method and degree of compaction shall be the same as specified above for portions of backfill within the limits of embankment or roadbed.

Filling and/or backfilling shall be continued in this manner to the elevation of the top of the pipe. Special care shall be taken to secure thorough compaction of the material placed under the haunches of the pipe to prevent damage or displacement of the pipe. All fill or backfill below the top of pipe shall be compacted mechanically in the manner and to the density prescribed above, regardless of whether or not such material is placed within the limits of the embankment or roadbed. In the case of pipe placed in trenches, that portion of the backfill above the top of the pipe which supports embankment or the roadbed shall receive mechanical compaction as specified above and the portion which will not support any portion of embankment or roadbed shall be placed in layers not more than 8 inches (200 mm) in depth (loose measurement) and shall be compacted by whatever means the Contractor chooses, to a density comparable with the adjacent, undisturbed material. Embankments above the top of pipe shall be placed conforming to Item No. 132S, "Embankment". During construction adequate cover must be provided to protect the structure from damage.

The Engineer or designated representative may reject backfill material that contains more than 20% by weight of material retained on a 3-in (75 mm) sieve, with large lumps not easily broken down, or that cannot be spread in loose layers. Material excavated by a trenching machine will generally meet the requirements of this Section as long as large stones are not present.

Where pipe extends beyond the toe of slope of the embankment and the depth of cover provided by backfill to the original ground level is less than the minimum required by the specifications for the type of pipe involved, additional material shall be placed and compacted until the minimum cover has been provided.

Whenever excavation is made for installing pipe culverts or box sewers across private property or beyond the limits of the embankment, the top soil removed in

excavating the trench shall be kept separate and replaced as nearly as feasible in its original position and the entire area involved in the construction operations shall be restored to a presentable condition.

C. Cement Stabilized Backfill

When indicated on the Drawings, trenches shall be backfilled to the elevations shown with cement stabilized backfill. The cement-stabilized backfill shall be placed equally along the sides of structures to prevent strain on or displacement of the structure.

Cement stabilized backfill below the spring line of pipe culverts shall be sufficiently plastic to completely fill all voids in the trench. Hand operated tampers may be used if necessary to fill the voids. The pipe shall be held in alignment by jacks or other suitable means to prevent the mortared joints from cracking due to displacement caused by placing the backfill material.

Cement stabilized backfill above the spring line of pipe culverts may be dry enough to be transported without special mixing equipment.

On structures other than pipe culverts, special mixing equipment will not be required to transport the cement stabilized backfill unless otherwise indicated on the Drawings.

D. Controlled Low Strength Material (CLSM)

When indicated on the Drawings the excavation shall be backfilled with CLSM to the elevations shown. The structure shall be prevented from being displaced or “floated out” during the placement of CLSM. The CLSM shall be prevented from entering culverts and drainage structures.

**401S.9 Measurement**

Unless otherwise indicated on the Drawings, structural excavation for pipe headwalls, inlets, manholes, culvert widening (extensions), bridge abutments and side road and private entrance pipe culverts will not be measured in the field but shall be included in the Plan Quantity unit price bid by the cubic yard (cubic meters: 1 cubic meter is equal to 1.308 cubic yards). Determination of plan quantities for structural excavation shall be made by the method of average end-areas using the following limits to establish templates for measurement.

A. For all structures requiring measurement, except the barrels of pipe culverts, no material outside of vertical planes 1 foot (300 mm) beyond the edges of the footings and parallel thereto will be included.

B. For the barrels of pipe culverts of 42 inches (1.09 meters) or less nominal or equivalent diameter, no material outside of vertical planes 1 foot (300 mm) beyond the horizontal projection of the outside surfaces of the pipe and parallel thereto will be included. For the barrels of pipe culverts more than 42 inches (1.09 meters) in nominal or equivalent diameter, no material outside of vertical planes located 2 feet

(600 mm) beyond the horizontal projection of the outside surfaces of the pipe and parallel thereto will be included.

C. If a cofferdam, as herein defined, is used, the limitations indicated above shall apply just as if no cofferdams were used.

D. Where excavation in addition to that allowed for the footings is required for other portions of the structure, such as for the cap, cross strut or tie beam of a pier or bent or for the superstructure, measurements for such additional excavation will be limited laterally by vertical planes 1 foot (300 mm) beyond the face of the member and parallel thereto and vertically to a depth of 1 foot (300 mm) below the bottom of such member.

E. Except as allowed by the above conditions, no account will be taken of any excavation necessary for placing forms or falsework.

F. Except at side road culverts, all street excavation called for on the contract drawings at all structure sites shall be assumed to be completed before starting the structural excavation and the measurement of structural excavation will include only material below or outside the limits of the completed street excavation. Excavation for side road and private entrance pipe culverts will not be measured for payment but shall be included in the unit price bid for this specification item.

G. On all structures of bridge classification where the contract drawings call for channel excavation at the structure site, it shall be assumed to have been completed before starting the structural excavation and the measurement of structural excavation will include only material below or outside the limits of the completed channel section. The method of measurement for payment will be in accordance with this procedure regardless of the actual construction methods followed.

H. Where excavation diagrams are indicated on the Drawings, they shall take precedence over these provisions.

I. Measurement will not include materials removed below footing grades to compensate for anticipated swellage due to pile driving and it will not include material required to be removed due to swellage beyond the specified limits during pile driving operations.

J. Measurement will not include additional yardage caused by slips, slides, cave-ins, siltings or fillings due to the action of the elements or the carelessness of the Contractor. Water will not be classed as excavated material.

K. Where rock, other incompressible or unstable material is undercut to provide suitable foundation for pipe or box culverts, such material below grade, ordered by the Engineer or designated representative to be removed, will be measured for payment.

L. Except for any required undercut, quantities for "Structural Excavation", as indicated on the Drawings, shall be considered as final quantities and no further measurement will be required, unless the alignment, grades or structure locations

are revised by the Engineer or designated representative during construction. Final determination of quantities for individual structures will be made, if in the opinion of the Engineer or designated representative or upon evidence furnished by the Contractor, substantial variations exist between quantities indicated on the Drawings and actual quantities due to changes in cross sections or apparent errors. Excavation quantities for foundations indicated on the Drawings where cofferdams are required shall be considered as final quantities and no further measurement will be made.

M. For any footing, foundation or other structure unit within the scope of this specification, additional measurement will be made of the volume of excavation involved in the lowering or raising of the elevation of a footing, foundation or structure unit, when such grade change is authorized by the Engineer or designated representative. Measurement will be made by the addition to or the deduction from, the original quantities for the volume of excavation involved in the authorized grade change.

N. Cement stabilized backfill shall be measured by the backfill diagram as indicated on the Drawings. The quantity of "Cement Stabilized Backfill" as indicated on the Drawings shall be considered as final quantities and no further measurement will be required, unless alignment or grade elevations as indicated are revised by the Engineer or designated representative. If such revisions result in an increase or decrease in this quantity, the final quantity will be revised by the amount represented by the changes in alignment or grade elevations.

**401S.10 Payment**

Payment for all work prescribed under this item and measured as provided above will be made at the unit bid price per cubic yard for the particular class of excavation specified on the Drawings in the amount shown on the Drawings and in the proposal. Payment for revised quantities will be made as specified above and for the removal of unstable and incompressible material as noted below.

Payment for removal and replacement of unstable or incompressible material below the footing grades of culverts and box sewers as indicated above will be made as follows:

When indicated on the Drawings or the Engineer or designated representative directs the use of special materials such as flexible base, concretebase, cement stabilized backfill, controlled low strength material or other special material, payment for excavation below the footing grades shall be made at the unit bid price for "Unclassified Structural Excavation", "Common Structural Excavation" or "Rock Structural Excavation", as the case may be. Payment for furnishing, hauling, placing and compacting the flexible base, concretebase, cement stabilized backfill, controlled low strength material or other special material will be made at the unit bid price for these items in the bid or in accordance with pertinent provisions for extra work.

Where special materials are not required or specified, the removal and replacement of the unstable material will be performed as described above. Payment therefore will be made at a price equal to 200 percent of the unit bid price per cubic yard for "Unclassified

Structural Excavation", "Common Structural Excavation" or "Rock Structural Excavation", as the case may be. The unit bid price shall include full compensation for removing the unstable or incompressible material, for furnishing, hauling, placing and compacting suitable material required to replace it and for all labor, equipment, tools and incidentals necessary to complete the work.

Payment for "Concrete Base", "Cement Stabilized Backfill" and “Controlled Low Strength Material” measured as prescribed above shall be made at the unit bid price per cubic yard. The unit bid price shall include full compensation for furnishing all materials, tools, labor, equipment, sheathing and incidentals required to perform the applicable work prescribed herein.

When the Engineer or designated representative judges it necessary to lower the structure footings to an elevation below the grade indicated on the Drawings, payment for the "Unclassified Structural Excavation", "Common Structural Excavation" or "Rock Structural Excavation" as the case may be, required below plan grade down to and including an elevation 5 feet (1.5 meters) below drawing grade for any individual footing will be made at a unit price equal to 115 percent of the contract unit bid price. Payment for the excavation from an elevation over 5 feet (1.5 meters) below plan grade down to and including an elevation 10 feet (3.05 meters) below plan grade will be made at a unit price equal to 125 percent of the contract unit bid price for "Unclassified Structural Excavation", "Common Structural Excavation" or "Rock Structural Excavation" as the case may be. No increase in unit price will be allowed for other bid items of the contract and no additional compensation will be allowed for any required cofferdam adjustments made necessary by such lowering of footings. These provisions shall not apply to the lowering of culverts, except when the flow line grade is lowered 1 foot (300 mm) or more below plan grade.

In cases where the extra depths required for any footing or footings exceeds 10 feet (3.05 meters), a supplemental agreement shall be made covering the quantities removed from depths in excess of 10 feet (3.05 meters) below plan grade.

No direct payment will be made for filling or backfilling around structures. Payment for the backfilling and compacting of areas, which were removed as structural excavation shall be included in the unit bid prices for the various classes of structural excavation.

At the end of each estimate period, the Engineer or designated representative shall determine the completed portion of the total work under Standard Specification Item No. 401S "Structural Excavation and Backfill" and payment shall be made accordingly.

Filling or backfilling of areas above the natural ground level or above the limits of street excavation or channel excavation sections shall be considered as Standard Specification Item No. 132S, "Embankment" and payment therefore shall be included in the unit prices bid for the various classes of Standard Specification Item No. 110S, "Street Excavation", Standard Specification Item No. 120S, "Channel Excavation" or Standard Specification Item No. 130S, "Borrow".

Where no channel excavation is provided for at culvert sites and where it is necessary to excavate beyond the limits of structural excavation, as herein described in order that the

culvert may function properly, such excavation shall be included with structural excavation as may be indicated on the Drawings.

Payment for all work prescribed under this item shall include full compensation for all excavation and backfill including compaction, all soundings, construction of all cofferdams, all dewatering and for furnishing all materials, labor, equipment, tools, sheathing, bracing, cofferdams, pumps, drills, explosives and incidentals necessary to complete the work, except for specific allowances stated above.

Special materials used or additional excavation made for the Contractor's convenience to expedite the work will not be paid for directly, but shall be included in the unit price bid for this specification item. In addition, if the Contractor's construction methods and equipment creates conditions necessitating usage of special materials or additional excavation, the work and materials will not be paid for directly, but shall be included in the unit price bid for this specification item.

When specified in the contract bid form as separate pay item(s), the item(s) will be paid for at the contract unit price(s) for "Flexible Base", "Lime Stabilized Base" and "Controlled Low Strength Material". 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 material, equipment, tools, labor and incidentals necessary to complete the Work.

Payment will be made under one of the following:

| | | |
|---|---|---|
| **Pay Item No. 401S-A:** | Unclassified Structural Excavation, Plan Quantity. | Per Cubic Yard. |
| **Pay Item No. 401S-B:** | Common Structural Excavation | Per Cubic Yard. |
| **Pay Item No. 401S-C:** | Rock Structural Excavation | Per Cubic Yard. |
| **Pay Item No. 401S-D:** | Concrete Base | Per Cubic Yard. |
| **Pay Item No. 401S-E:** | Cement Stabilized Backfill | Per Cubic Yard. |
| **Pay Item No. 401S-F:** | Flexible Base | Per Cubic Yard. |
| **Pay Item No. 401S-G:** | Lime Stabilized Base | Per Square Yard. |
| **Pay Item No. 401S-H:** | Controlled Low Strength Material | Per Cubic Yard. |
| **Pay Item No. 401S-I:** | Cofferdams, type _____ | Per Cubic Yard. |
| **Pay Item No. 401S-J:** | Dewatering | Per Cubic Yard. |

**End**

| ***SPECIFIC*** **CROSS REFERENCE MATERIALS** |
|---|
| **Standard Specification Item 401S, "Structural Excavation and Backfill"** |

City of Austin Standard Contract Documents

| Designation | Description |
|---|---|
| Section 00700 | General Conditions |
| Section 01550 | Public Safety and Convenience |

City of Austin Utilities Criteria Manual

| Designation | Description |
|---|---|
| Section 5.2.0 | Permit Information and Format |

City of Austin Standard Specification Items

| Designation | Description |
|---|---|
| Item No. 110S | Street Excavation |
| Item No. 111S | Excavation |
| Item No. 120S | Channel Excavation |
| Item No. 130S | Borrow |
| Item No. 132S | Embankment |
| Item No. 202S | Hydrated Lime and Lime Slurry |
| Item No. 203S | Lime Treatment for Materials in Place |
| Item No. 210S | Flexible Base |
| Item No. 302S | Aggregates for Surface Treatments |

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|---|---|
| Item No. 402S | Controlled Low Strength Material |
| Item No. 403S | Concrete for Structures |
| Item No.509S | Excavation Safety Systems |
| Item No. 610S | Preservation of Trees and Other Vegetation |

Texas Department of Transportation: Departmental Material Specifications

| Designation | Description |
|---|---|
| DMS-4640 | Chemical Admixtures for Concrete |

American Society for Testing and Materials, ASTM

| Designation | Description |
|---|---|
| ASTM C 33 | Specification For Concrete Aggregates |

Texas Department of Transportation: Manual of Testing Procedures

| Designation | Description |
|---|---|
| Tex-114-E | Laboratory Compaction Characteristics & Moisture-Density Relationship of Subgrade & Embankment Soil |
| Tex-120-E | Soil-Cement Testing |

| ***RELATED*** **CROSS REFERENCE MATERIALS** |
|---|
| **Standard Specification Item 401S, "Structural Excavation and Backfill"** |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|

| | |
|---|---|
| Item 110 | Excavation |
| Item 132 | Embankment |
| Item 400 | Excavation and Backfill for Structures |
| Item 401 | Flowable Backfill |
| Item 402 | Trench Excavation Protection |
| Item 403 | Temporary Special Shoring |
| Item 421 | Hydraulic Cement Concrete |

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**Item No. 402S**
**Controlled Low Strength Material**

## 402S.1 Description

This item governs Controlled Low Strength Material (CLSM) used for trench backfill and for filling abandoned culverts, pipes, other enclosures, and for other uses as indicated on the drawings, Standard Details or as approved by the Engineer or designated representative. CLSM is a low strength, self-compacting, flowable, cementitious material used in lieu of soil backfill. It is intentionally prepared at low strength to allow for future removal using conventional excavation equipment.

The CLSM shall be composed of Portland cement or fly ash, or both, filler aggregate and water. The CLSM, specified for use in filling abandoned culverts, pipes, or other enclosures, shall contain a settlement compensator, in addition to the other ingredients, to minimize settlement of the CLSM within the enclosure.

Normal Set CLSM shall be specified whenever the material will remain uncovered or will not be subjected to traffic or other loads within 24 hours after placement. Fast Set CLSM shall be specified whenever the material will be covered, subjected to traffic or other loads within 24 hours, or needed to expedite construction.

CLSM can be used for permanent subgrade repairs below the base layer, but shall not be used for permanent pavement repairs. For temporary traffic applications, a minimum 2 inch (50 mm) cap composed of Hot Mix-Cold Laid Asphaltic Concrete (TxDoT Standard Specification Item 334) shall be placed on the CLSM.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

## 402S.2 Submittals

The submittal requirements of this specification item include:

A. A mix design submittal including the results of unconfined compressive strength tests, air entrainment (if applicable), flow consistency, hardened unit weight, and timed Ball Drop and corresponding Penetrometer tests.

B. Certifications and test results for the cement fly ash, and admixtures.

C. Particle-size gradation and specific gravity tests on the filler aggregate.

## 402S.3 Materials

A. Cement.

Portland cement shall conform to ASTM C 150, Type I (General Purpose).

Portland cement manufactured in a cement kiln fueled by hazardous waste shall be considered as an approved product if the production facility is authorized to operate under regulation of the Texas Natural Resource Conservation Commission

(TNRCC) and the U. S. Environmental Protection Agency (EPA). Supplier shall provide current TNRCC and EPA authorizations to operate the facility.

B. Fly Ash

Fly ash shall conform to the requirements of Standard Specification Item No. 405, "Concrete Admixtures" and TxDOT Specification Item 437.

C. Filler Aggregate.

Filler aggregate shall consist of sand, stone screenings, pavement milling cuttings or other granular material that is compatible with the other mixture components. The filler aggregate shall be fine enough to stay in suspension to the extent required for proper flow without segregation, and, in the case of filling of enclosures, for minimal settlement. Filler aggregate shall have a Plasticity Index (TxDOT Test Method Tex-106-E) less than 15 and shall conform to the following gradation:

| Sieve Designation US | (SI) | Percent Passing |
|---|---|---|
| No. 200 | (75μm) | 0 - 10 |

D. Mixing Water.

Mixing water shall conform to the requirements of Standard Specification Item No. 403, "Concrete for Structures".

E. Settlement Compensator

An air entraining admixture with a higher than usual dosage, which meets the requirements of Standard Specification Item No. 405, "Concrete Admixtures", shall be used as a settlement compensator. The settlement compensator may be introduced to the CLSM at the job site by placement of prepackaged admixture in capsules or bags in the mixing drum in accordance with the admixture manufacturer's recommendations.

**402S.4 Mix Design**

The proportioning of CLSM shall be the responsibility of the Contractor. The Contractor shall furnish a mix design conforming to the requirements herein, for review and approval by the Engineer or designated representative. The mix design shall be prepared by a qualified commercial laboratory and then reviewed and signed by a registered Professional Engineer licensed in the State of Texas.

The Mix Design submittal must include:

A. Test results for unconfined compressive strength, air entrainment (if applicable), flow consistency, hardened unit weight, and timed Ball Drop (ASTM C-360) and corresponding Penetrometer tests (with a concrete pocket penetrometer),

B. Certifications and test results for the cement, fly ash, and admixtures, and

C. Results of particle-size gradation and specific gravity tests on the filler aggregate. The submittal shall include Penetrometer tests performed every thirty minutes

until the Ball Drop test shows a 2-inch (50 mm) indentation, as well as the predicted Penetrometer reading that corresponds to a 3-inch (75 mm) Ball Drop indentation. Particle-size gradation shall be determined using a series of sieves that gives no fewer than five uniformly spaced points for graphing the entire range of particle sizes larger than a No. 200 sieve (75-µm).

The Contractor shall perform the work required to substantiate the design at no cost to the City, including all testing. Approved mix designs shall be valid for one year, provided there are no changes in the type, source, or characteristics of the materials during that year.

At the end of one year, the mix design may be submitted for renewal, provided that:

A. field tests of the CLSM during the year have been satisfactory,
B. there have been no changes in type or source of the materials of the mix, and
C. the characteristics of the materials have not changed significantly since the original submittal.

The Contractor shall also submit certifications and test results for the cement, fly ash and admixtures, and particle-size gradation and specific gravity test results for the filler aggregate. The Contractor shall compare results of tests made on the filler aggregate at the end of the year to the results of tests reported in the original submittal. Gradation changes less than ten percent in percent passing any sieve and specific gravity changes less than five percent shall not be considered significant.

### 402S.5 Strength

The CLSM mix designs shall meet the unconfined compressive strength requirements outlined in the table below. The compression tests shall be conducted in accordance with TxDOT Method Tex-418-A, using approved unbonded caps on specimens with four-inch (100 mm) diameter and eight-inch (200 mm) height [or three-inch (75 mm) diameter by six-inch (150 mm) high specimens if a smaller capacity loading device gives more accurate results].

| Unconfined Compressive Strength, psi (mPa) | | |
|---|---|---|
| Age | Normal Set CLSM | Fast Set CLSM |
| 3 hours | — | 35 (0.24) minimum |
| 24 hours | 35 (0.24) minimum | — |
| 28 days | 300 (2.1) maximum | 300 (2.1) maximum |

### 402S.6 Flow Consistency

Flow consistency shall be established in tests involving the use of a six-inch (150 mm) length by three-inch (75 mm) diameter open-ended straight tubing made of steel, plastic or other non-absorbent material that is non-reactive with cement or fly ash. The tube shall be placed with one end on a horizontal flat surface and held in a vertical position. The tube shall then be filled to the top with CLSM. The top surface shall be struck off with a suitable straight edge and any spillage shall be removed from the base of the tube. Within five seconds thereafter the tube shall be raised carefully, using a steady

upward lift with no lateral or torsional motion. The entire test, from the start of filling until removal of the tube, shall be completed within 1½ minutes without interruption.

After removal of the tube, the spread of the CLSM shall be measured immediately along two diameters that are perpendicular to one another. The average of those two measurements is defined as the flow consistency of the mix. The flow consistency of the CLSM shall be considered satisfactory if a circular-type spread of the mix occurs without segregation and a flow consistency (average diameter of spread) of 8 inches (200 mm) or more is achieved.

### 402S.7 Air Entrainment

Air entraining admixture shall be added as a settlement compensator, whenever the CLSM will be used to fill an enclosure (Section 402S-1). The dosage shall be sufficient to result in an air content of 15 to 25 percent (as determined by TxDOT Method Tex-416-A) at the time of placement of the CLSM.

### 402S.8 Field Strength Tests

Ball Drop or Penetrometer tests shall be used to determine, when the CLSM has developed sufficient strength to be covered or subjected to traffic or other loads as approved by the Engineer or designated representative.

The Ball Drop test shall be performed according to the latest version of ASTM C-360. An indentation diameter of three inches (75 mm) or less, and the absence of a sheen or any visible surface water in the indentation area shall indicate that the CLSM has achieved the desired strength. Because trench width and depth may affect the test results, the Contractor may perform this test on a control sample of CLSM in a two-foot (600 mm) square by six-inch (150 mm) deep container.

Penetrometer tests using a hand-held, spring reaction-type device commonly called a concrete pocket penetrometer, shall be performed on the surface of the CLMS. A Penetrometer reading, equal to or greater than the value established in the mix design (Section 402S.4) for a Ball Drop test indentation of 3-inches (75 mm), shall indicate that the CLSM has achieved the desired strength.

### 402S.9 Construction Methods

A. General

The height of free fall placement of the CLSM shall not exceed four feet (1.2 meters). Since CLSM is considered to be self-compacting, a vibrator shall not be allowed. The CLSM shall not be covered with any overlying materials or subjected to traffic or other loads until the Ball Drop test or the Penetrometer test shows acceptable results (Section 402S.8) or until the CLSM has been in place a minimum of 24 hours for Normal Set CLSM and a minimum of 3 hours for Fast Set CLSM. Curing of the CLSM will not be required.

B. Utility Line Backfill

After the utility pipe has been placed and the proper bedding material placed in accordance with the details on the drawings, the trench may be immediately backfilled with the CLSM to the subgrade level shown on the drawings, Standard Details 1100S-6A, B, C & D, 430S-4, 511S-13A and 511S-13B or as directed by the Engineer or designated representative.

C. Culvert Backfill

Care shall be taken to prevent movement of the structure. If the pipe or structure moves either horizontally or vertically, the CLSM and the structure shall be immediately removed and the pipe or structure re-laid to proper line and grade.

D. Other Backfill

CLSM may be used for backfill material in lieu of soil as shown on the drawings, Standard Details or as approved by the Engineer or designated representative.

E. Filling Abandoned Culverts, Pipe, or other Enclosures

The CLSM shall be placed in a manner that allows all air or water, or both, to be displaced readily as the CLSM fills the enclosure.

### 402S.10 Acceptance Testing During Construction

The Engineer or designated representative may perform flow consistency, air entrainment, and unconfined compressive strength tests to determine if the CLSM meets the specification requirements. The number and frequency of acceptance tests will be determined by the Engineer or designated representative.

### 402S.11 Measurement and 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 "Controlled Low Strength Material". The bid prices shall include full compensation for all Work herein specified, including the furnishing of all materials, equipment, tools, labor and incidentals necessary to complete the Work.

Payment will be made under the following:

Pay Item No. 402S-A: Controlled Low Strength Material Per Cubic Yard.

**End**

| ***SPECIFIC*** CROSS REFERENCE MATERIALS |
|---|
| Standard Specification Item 402S, “Controlled Low Strength Material” |

City of Austin Standard Details

| Designation | Description |
|---|---|
| 430S-4 | Concrete Backfill Under Curb & Gutter |
| 506S-14 | Control or Mini Manhole |
| 511S-13A | Water Valve Box Adjustment to Grade W/ Full Depth Concrete |
| 511S-13B | Water Valve Box Adjustment to Grade W/ Concrete and H.M.A.C. |

| | |
|---|---|
| 1100S-6A | Narrow Excavation Next to C&G - Trench Width 0.3 M (12") & Less |
| 1100S-6B | Narrow Excavations - Trench Width 0.3 M (12") & Less |
| 1100S-6C | Excavation Next to C&G - Trench Width Greater than 0.3 M (12") |
| 1100S-6D | Excavations - Trench Width Greater than 0.3 M (12") |

City of Austin Standard Specification Items

| Designation | Description |
|---|---|
| Item No 403S | Concrete for Structures |
| Item No 405S | Concrete Admixtures |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item No. 334 | Hot Mix-Cold Laid Asphaltic Concrete Pavement |
| Item No. 420 | Concrete Structures |
| Item No. 421 | Portland Cement Concrete |
| Item No. 437 | Concrete Admixtures |

| ***RELATED*** CROSS REFERENCE MATERIALS |
|---|
| Standard Specification Item 402S, “Controlled Low Strength Material” |

Texas Department of Transportation: Manual of Testing Procedures

| Designation | Description |
|---|---|
| Tex-106-E | Method Of Calculating the Plasticity Index of Soils |
| Tex-416-A | Air Content of Freshly Mixed Concrete By The Pressure Method |
| Tex-418-A | Compressive Strength of Cylindrical Concrete |

American Society for Testing and Materials (ASTM)

| Designation | Description |
|---|---|
| ASTM C 150 | Portland Cement |
| ASTM C 360 | Ball Penetration in Fresh Portland Cement Concrete |
| ASTM C 403 | Time of Setting of Concrete Mixtures by Penetration Resistance |

City of Austin Standard Specification Items

| Designation | Description |
|---|---|
| Item No. 504S | Adjusting Structures |
| Item No. 506S | Manholes |
| Item No. 508S | Miscellaneous Structures and Appurtenances |
| Item No. 510 | Pipe |

**Item No. 403S**
**Concrete for Structures**

## 403S.1 Description

This item shall govern quality, storage, handling, proportioning and mixing of materials for hydraulic cement concrete construction of buildings, bridges, culverts, slabs, prestressed concrete and incidental appurtenances.

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.

## 403S.2 Submittals

The submittal requirements of this specification item may include:

Mix design option(s) of the class of concrete required on the project,

The supplier of the concrete mix design(s) and type of mixing equipment, and

Type of admixtures to be used with the concrete mixes.

## 403S.3 Materials

Concrete shall be composed of hydraulic cement or hydraulic cement and supplementary cementing materials, water, aggregates (fine and coarse), and admixtures proportioned and mixed as hereinafter provided to achieve specified results.

A. Cementitious Materials

Hydraulic cement shall conform to ASTM C 150, Type I (General Purpose), Type II (General Purpose with Moderate Sulfate Resistance) and Type III (High Early Strength). Type I shall be used when none is specified or indicated on the drawings. Type I and Type III cements shall not be used when a Type II cement is specified or indicated on the drawings. Type III cement may be used in lieu of a Type I cement, when the anticipated air temperature for the succeeding 12 hours will not exceed 60oF (15.6oC). A Type III cement shall only be used in precast concrete or when otherwise specified or allowed. All cement shall be of the same type and from the same source for a monolithic placement.

Unless otherwise specified the cementitious material content shall be limited to no more than 700 lbs. per cubic yard (417 kg per cubic meter). When supplementary cementing materials are used, cement is defined as “cement plus supplementary cementing material.” Supplementary cementing materials include fly ash (DMS 4610), ultra-fine fly ash (DMS-4610), ground granulated blast furnace slag grade 100 or 120 (DMS-4620), silica fume (DMS-4630) and metakaolin (DMS-4635).

Supplementary cementing materials shall not be used when white hydraulic cement is specified.

Class C flyash shall not be used in sulfate-resistant concrete.

Hydraulic cement manufactured in a cement kiln fueled by hazardous waste shall be considered as an approved product if the production facility is authorized to operate under regulation of the Texas Commission on Environmental Quality (TCEQ) and the U. S. Environmental Protection Agency (EPA). Supplier shall provide current TNRCC and EPA authorizations to operate the facility.

When sulfate-resistant concrete is required for a project, mix design options 1, 2, 3 or 4 presented in Section 403S.8, "Mix Design Options" shall be used to develop appropriate mix design utilizing Type I/II, II, V, IP or IS cement.

B. Mixing Water

Water for use in concrete and for curing shall be potable water free of oils, acids, organic matter or other deleterious substances and shall not contain more than 1,000 parts per million of chlorides as Cl or sulfates as SO4.

Water from the City of Austin will not require testing. Contractor may request approval of water from other sources. Contractor shall arrange for samples to be taken from the source and tested at the Contractor's expense. When water from other sources is proposed, test reports shall be provided that indicates compliance with Table 1 before use.

| Table 1: Chemical Limits for Mix Water | | |
|---|---|---|
| Contaminant | Test Method | Maximum Concentration (ppm) |
| Chloride (CL)<br>Prestressed concrete<br>Bridge decks & superstructure<br>All other concrete | ASTM D-512 | <br>500<br>500<br>1,000 |
| Sulfate (SO4) | ASTM D-516 | 1,000 |
| Alkalies (NA2O + 0.658 K2O) | ASTM D-4191 & D-4192 | 600 |
| Total Solids | AASHTO T-26 | 50,000 |

Water that has an adverse effect on the air-entraining agent or any other chemical admixture or on strength or time of set of the concrete shall not be used. Water used in white Portland cement concrete shall be free from iron and other impurities, which may cause staining, or discoloration.

C. Coarse Aggregate

Coarse aggregate shall consist of durable particles of crushed or uncrushed gravel, crushed blast furnace slag, crushed stone or combinations thereof; free from frozen material or injurious amounts of salt, alkali, vegetable matter or other objectionable material either free or as an adherent coating. When white hydraulic

cement is specified, the coarse aggregates used in the concrete shall be light colored. Quality shall be reasonably uniform throughout.

The coarse aggregate from each source shall not contain more than 0.25 percent by weight of clay lumps, nor more than 1.0 percent by weight of shale nor more than 5 percent by weight of laminated and/or friable particles when tested in accordance with TXDOT Test Method TEX-413-A. The coarse aggregate from each source shall have a wear of not more than 40 percent when tested in accordance with TXDOT Test Method TEX-410-A.

Unless otherwise indicated on the drawings, the coarse aggregate from each source shall be subjected to 5 cycles of the soundness test conforming to TXDOT Test Method TEX-411-A. The loss shall not be greater than 12 percent when sodium sulfate is used or 18 percent when magnesium sulfate is used.

Coarse aggregate shall be washed. The Loss by Decantation (TXDOT Test Method TEX-406-A), plus allowable weight of clay lumps, shall not exceed 1 percent or the value indicated on the drawings or in the project manual, whichever is less. If material finer than the # 200 (75 micrometer) sieve is definitely established to be dust of fracture of aggregates made primarily from crushing of stone, essentially free from clay or shale as established by Part III of TXDOT Test Method TEX-406-A, the percent may be increased to 1.5. When crushed limestone coarse aggregate is used in concrete pavements, the decant may exceed 1% but not more than 3% if the material finer than the # 200 (75 micrometer) sieve is determined to be at least 67% calcium carbonate in accordance with TxDoT Test Method Tex-406-A, Part III.

The coarse aggregate factor may not be more than 0.82; however, when voids in the coarse aggregate exceed 48 percent of the total rodded volume, the coarse aggregate factor shall not exceed 0.85. The coarse aggregate factor may not be less than 0.68 except for a Class I machine extruded mix that shall not have a coarse aggregate factor lower than 0.61.

When exposed aggregate surfaces are required, the coarse aggregate shall consist of particles with at least 40 percent crushed faces. Uncrushed gravel, polished aggregates and clear resilient coatings are not acceptable for exposed aggregate finishes.

When tested by approved methods, the coarse aggregate including combinations of aggregates when used, shall conform to the grading requirements shown in Table 2.

Table 2: Coarse Aggregate Gradation Chart (Percent Passing)

| Grade | Nom. Size | 2-1/2" (62.5 mm) | 2" (50 mm) | 1 ½" (37.5 mm) | 1" (25 mm) | 3/4" (19 mm) | 1/2" (12.5 mm) | 3/8" (9.5 mm) | No. 4 (4.75 mm) | No. 8 (2.36 mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2" (50 mm) | 100 | 80-100 | 50-85 | | 20-40 | | | 0-5 | |
| 2 (467)* | 1 1/2" (37.5 mm) | | 100 | 95-100 | | 35-70 | | 10-30 | 0-5 | |
| 3 | 1" (50 mm) | | 100 | 95-100 | | 60-90 | 25-60 | | 0-5 | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 (57)* | 1” (50 mm) | | | 100 | 95-100 | | 25-60 | | 0-10 | 0-5 |
| 5 (67)* | 3/4” (19 mm) | | | | 100 | 90-100 | | 20-55 | 0-10 | 0-5 |
| 6 (7)* | ½" (12.5 mm) | | | | | 100 | 90-100 | 40-70 | 0-15 | 0-5 |
| 7 | 3/8" (9.5 mm) | | | | | | 100 | 70-95 | 0-25 | |
| 8 | 3/8" (9.5 mm) | | | | | | 100 | 95-100 | 20-65 | 0-10 |

Notes:

1. Recycled crushed concrete fine aggregate shall be limited to a maximum of 20% of the fine aggregate.

2. The use of recycled crushed hydraulic cement concrete as a coarse aggregate shall be limited to Concrete Classes A, B and D (see Table 5).

D. Fine Aggregate

Fine aggregate shall be washed and consist of clean, hard, durable and uncoated particles of natural or manufactured sand or a combination thereof, with or without a mineral filler. When white hydraulic cement is specified, the fine aggregates used in the concrete shall be light colored. Quality shall be reasonably uniform throughout It shall be free from frozen material or injurious amounts of salt, alkali, vegetable matter or other objectionable material and it shall not contain more than 0.5 percent by weight of clay lumps in accordance with TEX-413-A. When subjected to color test for organic impurities per TXDOT Test Method TEX-408-A, it shall not show a color darker than standard.

Unless indicated otherwise on the drawings the acid insoluble residue of fine aggregate used in slab concrete subject to direct traffic shall not be less than 60 percent by weight (mass) when tested conforming to TXDOT Test Method TEX-612-J.

Unless indicated otherwise on the Drawings, fine aggregate shall be blended, when necessary, to meet the acid insoluble residue requirement.

When blending the following equation shall be used:

Acid Insoluble (%) = {(A1)(P1)+(A2)(P2)}/100

Where:

A1 = acid insoluble (%) of aggregate 1,

A2 = acid insoluble (%) of aggregate 2,

P1 = % by weight of A1 of the fine aggregate blend, and

P2 = % by weight of A2 of the fine aggregate blend.

When tested in accordance with TxDoT Test Method Tex-401-A, the fine aggregate, including mineral filler and combinations of aggregates, when used, shall conform to the grading requirements shown in Table 3.

Table 3: Fine Aggregate Gradation Chart1 (Grade 1 - Percent Passing)

| 3/8 (9.5 mm) | No. 4 (4.75 mm) | No. 8 (2.36 mm) | No. 16 (1.18 mm) | No. 30 (600 µm) | No. 50 (300 µm) | No. 100 (150 µm) | No. 200 (75 µm) |
|---|---|---|---|---|---|---|---|
| 100 | 95-100 | 80-100 | 50-85 | 25-65 | 10-351 | 0-10 | 0-32 |

Notes:

1. Recycled crushed concrete fine aggregate shall be limited to a maximum of 20% of the fine aggregate.

2. The use of recycled crushed hydraulic cement concrete as a fine aggregate shall be limited to Concrete Classes A, B and D (see Table 5).

3. 6 to 35 when sand equivalent value is greater than 85.

4. 0 to 6 for manufactured sand.

   Sand equivalent per TXDOT Test Method TEX-203-F shall not be less than 80 nor less than otherwise indicated on the drawings, whichever is greater.

   The fineness modulus will be determined by adding the percentages by weight retained on sieve Nos. 4, 8, 16, 30, 50 and 100 (4.75 mm, 2.36 mm, 1.18mm, 600 µm, 300 µm, and 150 µm) and dividing the sum of the six sieves by 100. For all classes of concrete except K (see Table 5), the fineness modulus shall be between 2.30 and 3.10. For Class K concrete, the fineness modulus shall be between 2.40 and 2.90, unless indicated otherwise on the Drawings.

E. Mineral Filler

Mineral filler shall consist of stone dust, clean crushed sand or other approved inert material. When tested in accordance with TxDoT Test Method Tex-401-A, it shall conform to the following gradation:

Passing the No. 30 (600 µm) Sieve 100 percent

Passing the No. 200 (75 µm) Sieve 65 to 100 percent

F. Mortar and Grout

Unless otherwise specified, indicated on the drawings or approved by the Engineer or designated representative mortar and grout shall consist of 1 part hydraulic cement, 2 parts finely graded sand and enough water to make the mixture plastic. When required to prevent color difference, white cement shall be added to produce color required. When required by the Engineer or designated representative, approved latex adhesive may be added to the mortar. Mortar shall be provided with a consistency such that the mortar can be easily handled and spread by trowel.

Grout shall be provided of a consistency that will flow into and completely fill all voids.

G. Admixtures

All chemical admixtures including water reducing, placticizers and air entrainment shall conform to TxDoT DMS-4640, “Chemical Admixtures for Concrete”. Calcium chloride-based admixtures shall not be approved. Admixtures shall be included in the prequalified concrete admixtures list maintained by TxDot’s Construction Division. High-range water-reducing admixtures (TxDoT Type F or G) and accelerating admixtures (TxDoT Type C or E) shall not be used in bridge deck concrete.

H. Air Entrainment

Unless indicated otherwise on the drawings, all concrete classes with the exception of Class B shall be air;entained in accordance with Table 8. If the air content is more than 1-1/2 percentage points below or 3 percentage points above the required air, the load of concrete will be rejected. If the air content is more than 1-1/2 but less than 3 percentage points above the required air, the concrete may be accepted based on strength test results.

## 403S.4 Storage of Materials

A. Cement, Supplementary Cementing Materials and Mineral Filler

All cement, supplementary cementing materials and mineral filler shall be stored in separate and well ventilated, weatherproof buildings or approved bins, which will protect the material from dampness or absorption of moisture. Storage facilities shall be easily accessible and each shipment of packaged cement shall be kept separated to provide for identification and inspection. The Engineer or designated representative may permit small quantities of sacked cement to be stored in the open for a maximum of 48 hours on a raised platform and under waterproof covering.

B. Aggregates

The method of handling and storing concrete aggregates shall prevent contamination with foreign materials. If the aggregates are stored on the ground, the sites for the stockpiles shall be clear of all vegetation and shall be level. Aggregates shall be stockpiled in sizes to facilitate blending. If the aggregate is not stockpiled on a hard, non-contaminant base, the bottom 6-inch (150 mm) layer of the stockpile shall not be used without recleaning the aggregate.

When conditions require the use of 2 or more grades of coarse aggregates, separate stockpiles shall be maintained to prevent intermixing. Where space is limited, stockpiles shall be separated by walls or other appropriate barriers.

Aggregate shall be stockpiled and protected from the weather a minimum of 24 hours prior to use to minimize free moisture content. When stockpiles are too large to protect from the weather, accurate and continuous means acceptable to the Engineer or designated representative shall be provided to monitor aggregate

temperature and moisture. Aggregates shall be stockpiled and handled such that segregation and contamination are minimized.

The stockpiles shall be sprinkled to control moisture and temperature as necessary. A reasonably uniform moisture content shall be maintained in aggregate stockpiles.

C. Admixtures

Admixtures shall be stored in accordance with manufacturer's recommendations and shall be protected against freezing.

D. Hot Weather Concrete Mixes

Ice may be used during hot weather concrete placement (Section 13 of Standard Specification Item No. 410S, "Concrete Structures") to lower the concrete temperature; however, the Contractor shall furnish a mix design acceptable to the Engineer or designated representative for class of concrete specified. The addition of ice shall not exceed 50% of the total mix water weight.

## 403S.5 Measurement of Materials

Water shall be accurately metered. Fine and coarse aggregates, mineral filler, bulk cement and fly ash shall be weighed separately. Allowances shall be made in the water volume and aggregate weights during batching for moisture content of aggregates and admixtures. Volumetric and weight measuring devices shall be acceptable to the Engineer or designated representative. Measurement of materials in non-volumetric and volumetric mixers shall conform to Section 421.4.D of TxDot Specification Item 421, "Hydraulic Cement Concrete".

Batch weighing of sacked cement is not required; however, bags, individually and entire shipments, may not vary by more than 3 percent from the specified weight of 94 pounds (42.6 kilograms) per bag. The average bag weight of a shipment shall be determined by weighing 50 bags taken at random.

## 403S.6 Mix Design

The Contractor shall furnish a mix design acceptable to the Engineer or designated representative for the class of concrete required in accordance with Table 5. The mix shall be designed by a qualified commercial laboratory and signed/sealed by a registered Professional Engineer, licensed in the state of Texas to conform with requirements contained herein, to ACI 211.1 or TXDOT Bulletin C-11 (and supplements thereto). The maximum water-to-cementitious material ratio identified in Table 5 for specific classes of concrete shall not be exceeded.

A higher-strength class of concrete with equal or lower water-to-cementituous-material ratio may be substituted for the specified class of concrete.

The mix design shall be over-designed in accordance with Table 5 in order to account for production variability and to ensure minimum compressive strength requirements are met.

Allowable mix design options are presented in Section 403S.8.

The Contractor shall perform, at the Contractor's expense, the work required to substantiate the design, including testing of strength specimens. Complete concrete design data shall be submitted to the Engineer or designated representative for approval. The mix design will be valid for a period of one (1) year provided that there are no changes to the component materials.

When there are changes in aggregates or in type, brand or source of cement, supplementary cementing material or chemical admixtures, the mix shall be evaluated as n new mix design. A change in vendor does not necessarily constitute a change in materials or source. When only the brand or source of cement is changed and there is a prior record of satisfactory performance of the cement with the ingredients, the submittal of new trial batches may be waived by the Engineer or designated representative.

At the end of one (1) year, a previously approved mix may be resubmitted for approval if it can be shown that no substantial change in the component materials has occurred and that test results confirming the adequacy of the mix designs have been acquired during the previous year. The resubmittal analysis must be reviewed, signed and sealed by a registered Professional Engineer, licensed in the state of Texas. This resubmittal shall include a reanalysis of specific gravity, absorption, fineness modulus, sand equivalent, soundness, wear and unit weights of the aggregates. Provided that the fineness modulus did not deviate by more than 0.20 or that the re-proportioned total mixing water, aggregate and cement (or cement plus fly ash) are within 1, 2, and 3 percent, respectively, of pre-approved quantities, a one-year extension on the approval of the mix may be granted by the Engineer or designated representative. Updated cement, fly ash, and admixture certifications shall accompany the resubmittal.

Approved admixtures that are included in the prequalified concrete admixtures list maintained by TxDot's Construction Division may be used with all classes of concrete at the option of the Contractor provided that specific requirements of the governing concrete structure specification are met. Water reducing and retarding agents shall be required for hot weather, large mass, and continuous slab placements. Air entraining agents may be used in all mixes but must be used in the classes indicated on Table 5. Unless approved by the Engineer or designated representative, mix designs shall not exceed air contents for extreme exposure conditions as recommended by ACI 211.1 for the various aggregate grades.

## 403S.7 Consistency and Quality of Concrete

Concrete shall be workable, cohesive, possess satisfactory finishing qualities and of stiffest consistency that can be placed and vibrated into a homogeneous mass within slump requirements specified in Table 4 without the development of segregation or honeycombing. No concrete will be permitted with a slump in excess of the maximums

shown unless water-reducing admixtures have been previously approved. Concrete that exceeds the maximum acceptable placement slump at time of delivery will be rejected. Slump values shall be conducted in accordance with TXDOT Test Method TEX-415-A.

Consistency and quality of concrete should allow efficient placement and completion of finishing operations before initial set. Re-tempering (i.e. addition of water and reworking concrete after initial set) shall not be allowed. When field conditions are such that additional moisture is needed for final concrete surface finishing operation, the required water shall be applied to surface by fog spray only and shall be held to a minimum. Excessive bleeding shall be avoided and in no case will it be permissible to expedite finishing and drying by sprinkling the surface with cement powder.

Table 4: Slump Requirements

| | Slump1, inches (mm) | |
|---|---|---|
| Type of Construction | Maximum | Minimum |
| Cased Drilled Shafts | 4 (100) | 3 (75) |
| Reinforced Foundation Caissons and Footings | 3 (75) | 1 (25) |
| Reinforced Footings and Substructure Walls | 3 (75) | 1 (25) |
| Uncased Drilled Shafts | 6 (150) | 5 (125) |
| Thin-walled Sections; 9 inches (225 mm) or less | 6 ½ (165) | 4 (100) |
| Prestressed Concrete Members1 | 6 ½ (165) | 4 (100) |
| Precast Drainage Structures | 6 (150) | 4 (100) |
| Wall Sections over 9 inches (225 mm) | 5 (125) | 3 (75) |
| Reinforced Building Slabs, Beams, Columns and Walls | 4 (100) | 1 (25) |
| Bridge Decks | 4 (100) | 2 (50) |
| Pavements, Fixed-form | 6 ½ (165) | 4 (100) |
| Pavements, Slip-form | 3 (75 ) | 1-½ (37.5) |
| Sidewalks, Driveways and Slabs on Ground | 4 (100) | 2 (50) |
| Curb & Gutter, Hand-vibrated | 3 (75) | 1 (25) |
| Curb & Gutter, Hand-tamped or spaded | 4 (100) | 2 (50) |
| Curb & Gutter, Slip-form/extrusion machine | 2 (50) | ½ (12.5) |
| Heavy Mass Construction | 2 (50) | 1 (25) |
| High Strength Concrete | 4 (100) | 3 (75) |
| Riprap and Other Miscellaneous Concrete | 6 (150) | 1 (25) |
| Under Water or Seal Concrete | 8 ½ (213) | 6 (150) |

1. Slump values when a high range water reducer (HRWR) is not used.

2. When a high range water reducer (HRWR) is used, maximum acceptable placement slump will be 9 in (225 mm)

During progress of the work, the Engineer or designated representative shall cast test cylinders as a check on compressive strength of concrete actually placed. The Engineer or designated representative may also perform slump tests, entrained air tests and temperature checks to ensure compliance with specifications.

Proportioning of all material components shall be checked prior to discharging. Excluding mortar material for pre-coating of the mixer drum [see section 403S.8.B and adjustment for moisture content of admixtures and aggregates, material components shall fall within the range of + 1% for water, + 2% for aggregates, + 3% for cement, +2% for fly ash and within manufacturer recommended dosage rates for admixtures except that air entrainment shall be within + 1-1/2 percentage points of the mix design requirements.

Unless otherwise specified or indicated on the drawings, concrete mix temperature shall not exceed 90°F (32oC) except in mixes with high range water reducers where a maximum mix temperature of 100°F (38oC) will be allowed. Cooling an otherwise acceptable mix by addition of water or ice during agitation will not be allowed.

Test cylinders will be required for small placements such as manholes, inlets, culverts, wing walls, etc. The Engineer or designated representative may vary the number of tests to a minimum of 1 for each 25 cubic yards (1 for each 19 cubic meters) placed over a several day period.

Test cylinders shall be required for each monolithic placement of bridge decks or superstructures, top slabs of direct traffic culverts, cased drilled shafts, structural beams and as otherwise directed by Engineer or designated representative for design strength confirmation or early form removal. Test cylinders made for early form removal or for consideration of use of structure will be at Contractor's expense, except when required by Engineer or designated representative.

A strength test shall be defined as the average breaking strength of 2 cylinders. A minimum of four test cylinders shall be prepared; two each to be tested at 7 and 28 days. Specimens will be tested conforming to TXDOT Test Method TEX-418-A. If required strength or consistency of class of concrete being produced cannot be secured with minimum cementitious material specified or without exceeding maximum water/cementitious material ratio, Contractor will be required to furnish different aggregates, use a water reducing agent, an air entraining agent or increase the cement content in order to provide concrete meeting these specifications.

Slump tests will be performed in accordance with TxDoT Test Method Tex-415-A. Entrained air tests will be performed in accordance with TxDoT Test Method Tex-416-A.

Test specimens shall be cured using the same methods and under the same conditions as the concrete represented. Design strength cylinders shall be cured conforming to TXDOT Bulletin C-11 (and supplements thereto).

When control of concrete quality is by 28-day compressive tests, job control testing will be by 7-day compressive strength tests. The minimum strength requirement for seven (7) day test will be 70 percent of the specified minimum 28-day compressive strength. If the required 7-day strength is not secured with the quantity of cement specified in Table 4, changes in the mix design shall be made and resubmitted for approval. For an occasional failure of the seven-day compressive test, the concrete may be tested at 28 days for final evaluation.

Table 5: Classes of Concrete

| Class | Cement Sks Per CY | Minimum Strength, psi (MPa) | | Maximum W/C Ratio1 | Coarse Aggr. Grade 2,3,4 | Air Entrain. |
|---|---|---|---|---|---|---|
| | | 28 Days | 7 Days | | | |
| A | 5.0 (280 kg/m3) | 3000 (20.6) | 2100 (14.5) | 0.6 | 1,2,3,4, 8 | Yes |
| B | 4.0 (225 kg/m$^3$) | 2000 (13.8) | 1400 (9.7) | 0.6 | 2,3,4,5,6,7 | No |
| C5 | 6.0 (335 kg/m$^3$) | 3600(24.8) | 2520 (17.4) | 0.45 | 1,2,3,4,5,6 | Yes |
| D | 4.5 (252 kg/m$^3$) | 2500 (17.2) | 1750 (12.1) | 0.6 | 2,3,4,5,6,7 | No |
| H5 | 6.0 (335 kg/m$^3$) | As indicated | As Indicated | 0.45 | 3,4,5,6 | Yes |
| I | 5.5 (308 kg/m$^3$) | 3500 (24.1) | 2450 (16.9) | 0.45 | 2,3,4,5 | Yes |
| J | 2.0 (112 kg/m$^3$) | 800 (5.5) | 560 (3.9) | N/A | 2,3,4,5 | No |
| S5 | 6.0 (335 kg/m$^3$) | 4000 (27.6) | 2800 (19.3) | 0.45 | 2,3,4,5 | Yes |

Notes:

1. Maximum water-cement or water-cementitious ratio by weight

2 Unless otherwise allowed, Grade 1 coarse aggregate shall only be used in massive foundations with 4-in (100-mm) minimum clear spacing between reinforcing steel bars.

3. Grade 1 coarse aggregate grading shall not be used in drilled shafts.

4. Unless otherwise allowed, Grade 8 coarse aggregate shall be used in extruded curbs.

5. Structural concrete classes.

6. When Type II cement is used in Class C, S or A concrete, the 7-day compressive strength requirement will be 2310 psi (15.9 MPa) for Class C, 2570 psi (17.7 MPa) for Class S and 1925 psi (13.3 MPa) for Class A minimum.

Table 6: Over Design Required to Meet Compressive Strength Requirements$_1$

| Number Of Tests $_{2,3}$ | Standard Deviation, psi (MPa) | | | | |
|---|---|---|---|---|---|
| | 300 (2.06 ) | 400 (2.75 ) | 500 (3.44 ) | 600 (4.13) | 700 (4.82 ) |
| 15 | 470 (3.24 ) | 620 (4.27) | 850 (5.85) | 1,120 | 1,390 |

| | | | | | |
|---|---|---|---|---|---|
| | | | | (7.71) | (9.57) |
| 20 | 430 (2.96 ) | 580 (3.99) | 760 (5.23) | 1,010 (6.95) | 1,260 (8.67) |
| 30 or more | 400 (2.75 ) | 530 (3.65) | 670 (4.61) | 900 (6.20) | 1,130 (7.78) |

Notes:

1. When designing the mix, add the tabulated amounts to the minimum design strength in Table 5.Maximum water-cement or water-cementitious ratio by weight

2. Number of tests of a concrete mixture used to estimate the standard deviation of a concrete production facility. Test of another mix within 1,000 psi (6.88 MPa) of the specified strength may be used.

3. If less than 15 prior tests are available, the overdesign should be 1,000 psi (6.88 MPa) for specified strength less than 3,000 psi (20.65 MPa), 1,200 psi (8.26 MPa) for specified strengths from 3,000 to 5,000 psi (20.65 to 34.42 MPa) and 1,400 psi (9.64 MPa) for specified strengths greater than 5,000 psi (34.42 MPa).

Table 7: Expected Usage of Concrete Classes

| Class | General Usage |
|---|---|
| A | Inlets, manholes, curb, gutter, curb & gutter, concrete retards, sidewalks, driveways, backup walls and anchors |
| B | Riprap, small roadside signs and anchors |
| C5 | Drilled shafts, bridge substructure, bridge railing, culverts except top slab of direct traffic culverts, headwalls, wing walls, approach slabs, and cast-in-place concrete traffic barrier |
| D | Riprap |
| H5 | Prestressed concrete beams, boxes, piling and precast concrete traffic barrier |
| J | Utility trench repair |
| S5 | Bridge slabs and top slabs of direct traffic culverts |

Table 8: Air Entrainment[1]

| Nominal Maximum Aggregate Size In (mm) | % Air Entrainment | |
|---|---|---|
| | Moderate Exposure | Severe Exposure |
| 3/8 (9.5)- Grades 7 & 8 | 6 | 7-1/2 |
| 1/2 (12.5)- Grades 6 | 5-1/2 | 7 |
| 3/4 (19)- Grades 5 | 5 | 6 |
| 1 (25)- Grades 4 | 4-1/2 | 6 |
| 1-1/2 (37.5)- Grades 2 & 3 | 4-1/2 | 5-1/2 |
| 2 (50)- Grades 2 | 4 | 5 |

1. For specified concrete strengths above 5,000 psi (34.42 MPa) a reduction of 1 percentage point is allowed.

**403S.8 Mix Design Options**

For the structural concretes identified in Table 5 (Classes C, H and S) and any other class of concrete designed using more than 520 lbs. of cementitious material per cubic yard (310 kgs per cubic meter), one of the mix design options presented below shall be used.

For the non-structural concretes identified in Table 5 (Classes A, B, D and I) and any other class of concrete designed using less than 520 lbs. of cementitious material per cubic yard (310 kgs per cubic meter), one of the mix design options presented below will be used, except that Class C fly ash may be used instead of Class F fly ash for Options 1, 3 and 4 unless a sulfate-resistant concrete is required.

A. Option 1: Twenty (20) to thirty-five (35) percent of the cement may be replaced with Class F fly ash.

B. Option 2: Thirty-five (35) to fifty (50) percent of the cement may be replaced with ground granulated blast-furnace slag.

C. Option 3: Thirty-five (35) to fifty (50) percent of the cement may be replaced with a combination of Class F fly ash, ground granulated blast-furnace slag or silica fume. The combination may not include more than thirty-five (35) percent fly ash and no more than ten (10) percent silica fume.

D. Option 4: Type IP or Type IS will be used and up to ten (10) percent of the cement may be replaced with Class F fly ash, ground granulated blast-furnace slag or silica fume.

E. Option 5: Thirty-five (35) to fifty (50) percent of the cement may be replaced with a combination of Class C fly ash and at least six (6) percent of silica fume, ultra fine fly ash or metakaolin. The combination may not include more than thirty-five (35) percent fly ash and no more than ten (10) percent silica fume.

F. Option 6: A lithium nitrate admixture will be added at a minimum dosage of 0.55 gal. Of thirty (30) percent lithium nitrate solution per pound of alkalis present in the hydraulic cement.

G. Option 7: When hydraulic cement only is used in the design, the total alkali contribution from the cement in the concrete does not exceed 4.0 lbs. Per cubic yard, when calculated as follows:

alkali (lbs. per CY) = .01 (lbs cement/CY) (% $Na_2O$ equivalent in cement)

where (% $Na_2O$ equivalent in cement) is assumed to be the maximum cement alkali content reported on the cement mill certificate.

H. Option 8: When there are deviations from Options 1 through 7, the following shall be performed:

1. Conduct tests on both coarse and fine aggregate separately in accordance with ASTM C-1260, using 440 g of the proposed cementitious in the same proportions of hydraulic cement to supplementary cementing material to be used in the mix.

2. Prior to use of the mix, a certified test report signed and sealed by a Professional Engineer, licensed in the state of Texas shall be submitted that demonstrates that ASTM C 1260 test results for each aggregate do not exceed 0.10 percent expansion.

**403S.9 Mixing and Mixing Equipment**

All equipment, tools and machinery used for hauling materials and performing any part of the work shall be maintained in such condition to insure completion of the work without excessive delays for repairs and replacement. Mixing shall be done in a mixer of approved type and size that will produce uniform distribution of material throughout the mass and shall be capable of producing concrete meeting requirements of ASTM C 94, Ready-mixed Concrete and these specifications. Mixing equipment shall be capable of producing sufficient concrete to provide required quantities. Entire contents of the drum shall be discharged before any materials are placed therein for a succeeding batch. Improperly mixed concrete shall not be placed in a structure. For all mixers an adequate water supply and an accurate method of measuring the water shall be provided.

The mixer may be batched by either volumetric or weight sensing equipment and shall be equipped with a suitable timing device that will lock the discharging mechanism and signal when specified time of mixing has elapsed.

A. Proportioning and Mixing Equipment

For all miscellaneous concrete placements, a mobile, continuous, volumetric mixer or a volumetric or weight batch mixer of the rotating paddle type may be used.

When approved by Engineer or designated representative in writing or when specified for use in other items, these mixers may be used for other types of concrete construction, including structural concrete, if the number of mixers furnished will supply the amount of concrete required for the particular operation in question.

These mixers shall be designed to receive all the concrete ingredients, including admixtures, required by the mix design in a continuous uniform rate and mix them to the required consistency before discharging.

For continuous volumetric mixers, the materials delivered during a revolution of the driving mechanism or in a selected interval, will be considered a batch and the proportion of each ingredient will be calculated in the same manner as for a batch type plant.

Mixing time shall conform to recommendations of manufacturer of mixer unless otherwise directed by Engineer or designated representative.

B. Ready-mixed Concrete

Use of ready-mixed concrete will be permitted provided the batching plant and mixer trucks meet quality requirements specified herein. When ready-mixed concrete is used, additional mortar (1 sack cement, 3 parts sand and sufficient water) shall be added to each batch to coat the mixer drum. Ready-mixed concrete, batching plant and mixer truck operation shall include the following:

1. A ticket system will be used that includes a copy for the Inspector. Ticket will have machine stamped time/date of concrete batch, a mix design designation, weight of cement, fly ash, sand and aggregates; exact nomenclature and written quantities of admixtures and water. Any item missing or incomplete on ticket may be cause for rejection of concrete.

2. Sufficient trucks will be available to support continuous placements. The Contractor will satisfy the Engineer or designated representative that adequate standby trucks are available to support monolithic concrete placement requirements.

3. A portion of mixing water required by the mix design to produce the specified slump may be withheld and added at the job site, but only with permission of the Engineer or designated representative and under the Inspector's observation. When water is added under these conditions, the concrete batch will be thoroughly mixed before any slump or strength samples are taken. Additional cement shall not be added at the job site to otherwise unacceptable mixes.

4. A metal plate(s) shall be attached in a prominent place on each truck mixer plainly showing the various uses for which it was designed. The data shall include the drum's speed of rotation for mixing and for agitating and the capacity for complete mixing and/or agitating only. A copy of the manufacturer's design, showing dimensions of blades, shall be available for inspection at the plant at all times. Accumulations of hardened concrete shall be removed to the satisfaction of the Engineer or designated representative.

5. The loading of the transit mixers shall not exceed capacity as shown on the manufacturer's plate attached to the mixer or 63 percent of the drum volume, whichever is the lesser volume. The loading of transit mixers to the extent of causing spill-out enroute to delivery will not be acceptable. Consistent spillage will be cause for disqualification of a supplier.

6. Excess concrete remaining in the drum after delivery and wash water after delivery shall not be dumped on the project site unless approval of the dump location is first secured from the Engineer or designated representative.

C. Volumetric Batching

Use of volumetric batched concrete will be permitted provided the batching and continuous mixing operations conform to ASTM C 685, “Concrete Made By Volumetric Batching and Continuous Mixing”. This type concrete shall be made from materials continuously batched by volume, mixed in a continuous mixer and delivered to the site in a freshly mixed and unhardened state. Tests and criteria for batching accuracy and mixing efficiency shall be as specified in ASTM C 685.

A ticket system will be used that includes a copy for the Inspector. The ticket will have machine stamped time/date of concrete batch, a mix design designation, weight of cement, fly ash, sand and aggregates; exact nomenclature and written quantities of admixtures and water. Any item missing or incomplete on ticket may be cause for rejection of concrete.

Each batching or mixing unit, or both, shall carry in a prominent place a metal plate or plates on which are plainly marked the gross volume of the unit in terms of mixed concrete, discharge speed and the weight-calibrated constant of the machine in terms of a revolution counter or other output indicator. The mixer shall produce a thoroughly mixed and uniform concrete.

The batcher-mixer unit shall contain in separate compartments all the necessary ingredients needed for the manufacture of concrete. The unit shall be equipped with calibrated proportioning devices to vary the mix proportions and it shall produce concrete as required by the Work and ASTM C 685.

D. Truck-mixed Concrete

The concrete shall be mixed in a truck mixer from 70 to 100 revolutions at the mixing speed designated by the manufacturer that will produce a uniform concrete mix. The concrete shall be delivered to the project in a thoroughly mixed and uniform mass and shall be discharged with a satisfactory degree of uniformity. Additional mixing at the job site, at the mixing speed designated by the manufacturer, may be allowed by the Engineer or designated representative as long as the concrete is discharged before the drum has revolved a total of 300 revolutions after the introduction of the mixing water to the cement and the aggregates.

Re-tempering or adding concrete chemical admixtures is only permitted at the job site when concrete is delivered in a truck mixer. Water shall not be added after introduction of mixing water at the batch plant except on arrival at the job site with approval of the Engineer or designated representative, in order to adjust the slump of the concrete. When this water is added, the mix design water-cementitious-material ratio shall not be exceeded. The drum or blades shall be turned at least 30 additional revolutions at mixing speed to ensure thorough and uniform mixing of the concrete. Water or chemical admixtures shall not be added to the batch after any concrete has been discharged.

When the concrete contains silica fume, mixing times and batching operations shall be adjusted as necessary to ensure that the material is completely and uniformly dispersed in the mix. The dispersion of the silica fume within the mix shall be verified in trial batches.

E. Hand-mixed Concrete

Hand mixing of concrete may be permitted for small placements or in case of an emergency and then only on authorization of the Engineer or designated representative. Hand-mixed batches shall not exceed a 4 cubic foot (0.113 cubic meters) batch in volume. Material volume ratios shall not be leaner than 1 part cement, 2 parts large aggregate, 1 part fine aggregate and enough water to produce a consistent mix with a slump not to exceed 4 inches (100 mm). Admixtures shall not be used unless specifically approved by the Engineer or designated representative.

## 403S.10 Excavation, Placing of Concrete, Finishing, Curing and Backfill

Excavation, placing of concrete, finishing, curing and backfill shall conform to Standard Specification Item No. 401S, "Structural Excavation and Backfill", Standard Specification Item No. 410S, "Concrete Structures" and Standard Specification Item No. 411S, "Surface Finishes for Concrete".

## 403S.11 Measurement

Where measurement of concrete for a structure is not provided by another governing pay item, measurement shall be made under this specification in accordance with the following.

The quantities of concrete of the various classifications which constitute the completed and accepted structure or structures in place will be measured by the cubic yard (cubic meters:1 cubic meter is equal to 1.308 cubic yards), each, square yard (square meter: 1 square yard equals 0.836 square meters) or linear foot as indicated in the Contract Documents. Measurement will be as follows:

A. General

1. Measurement based on dimensions shall be for the completed structure as measured in place. However, field-measured dimensions shall not exceed those indicated on the drawings or as may have been directed by the Engineer or designated representative in writing.

2. No deductions shall be made for chamfers less than 2 inches (50 mm) in depth, embedded portions of structural steel, reinforcing steel, nuts, bolts, conduits less than 5 inches (125 mm) in diameter, pre/post tensioning tendons, keys, water stops, weep holes and expansion joints 2 inches (50 mm) or less in width.

3. No measurement shall be made for concrete keys between adjoining beams or prestressed concrete planks.

4. No measurement shall be made for fill concrete between the ends or adjoining prestressed concrete planks/box beams at bent caps or between the ends of prestressed concrete planks/box beams and abutment end walls.

5. No measurement shall be made for inlet and junction box invert concrete.

6. No measurement shall be made for any additional concrete required above the normal slab thickness for camber or crown.

B. Plan Quantity. For those items measured for plan quantity payment, adequate calculations have been made. If no adjustment is required by Article 403S.12, additional measurements or calculations will not be required or made.

C. Measured in Place. For those items not measured for Plan Quantity payment, measurement will be made in place, subject to the requirements of Article 403S.10.A.1 above.

**403S.12 Payment**

The work performed and materials furnished as prescribed by this item and measured in accordance with the applicable provisions of "Measurement" above will be paid for as follows.

The quantity to be paid for will be that quantity indicated in the contract documents and/or shown on the drawings, regardless of errors in calculations, except as may be modified by the following.

Plan Quantities will be adjusted:

A. When a complete structure element has been erroneously included or omitted from the drawings, the quantity shown on the drawings for that element will be added to or deducted from the plan quantity and included for payment. A complete structure element will be the smallest portion of a total structure for which a quantity is included on the drawings. Quantities revised in this manner will not be subject to the provisions of the "General Conditions", Article 11.

B. When the plan quantity for a complete structure element is in error by 5 percent or more, a recalculation will be made and the corrected quantity included for payment. Quantities revised in this manner will not be subject to the provisions of the "General Conditions", Article 11

C. When quantities are revised by a change in design, the "plan quantity" will be increased or decreased by the amount involved in the design change. Quantities revised in this manner will be subject to the provisions of the "General Conditions", Article 11.

The party to the contract requesting the adjustment shall present to the other, a copy of the description and location, together with calculations of the quantity for the structure element involved. When this quantity is certified correct by the Engineer or designated representative, it will become the revised plan quantity.

Payment for increased or decreased costs due to a change in design on those items measured as "Cubic Yard", "Each", "Square Foot", "Square Yard" or "Linear

Foot" will be determined by Change Order. Quantities revised in this manner will be subject to the provisions of the "General Conditions", Article 11.

The unit prices bid for the various classes of concrete shown shall include full compensation for furnishing, hauling, and mixing all concrete material; placing, finishing and curing all concrete; all grouting, pointing and finishing; furnishing and placing drains; furnishing and placing metal flashing strips; furnishing and placing expansion joint material required by this item; and for all forms and false work, labor, tools, equipment and incidentals necessary to complete the work.

| | | |
|---|---|---|
| Pay Item No. 403S-CY: | (Structure or Structural Component) - | Per Cubic Yard. |
| Pay Item No. 403S-EA: | (Structure or Structural Component) - | Per Each. |
| Pay Item No. 403S-SY: | (Structure or Structural Component) - | Per Square Yard. |
| Pay Item No. 403S-LF: | (Structure or Structural Component) - | Per Lineal Foot. |

**End**

| SPECIFIC CROSS REFERENCE MATERIALS |
| --- |
| **Standard Specification Item 403S, "Concrete For Structures"** |

City of Austin Standard Specification Items

| Designation | Description |
| --- | --- |
| Item No. 401S | Structural Excavation and Backfill |
| Item No. 410S | Concrete Structures |
| Item No. 411S | Surface Finishes for Concrete |

Texas Department of Transportation: Departmental Material Specifications

| Designation | Description |
| --- | --- |
| DMS-4640 | Chemical Admixtures for Concrete |
| DMS-4610 | Fly Ash |
| DMS-4620 | Ground Granulated Blast-Furnace Slag |
| DMS-4630 | Silica Fume |
| DMS-4635 | Metakaolin |

American Association of State Highway & Transportation Officials,
AASHTO Standard Method of Test for

| Designation | Description |
| --- | --- |
| Method T 26 | Quality of Water to be Used in Concrete |

American Concrete Institute, ACI

| Designation | Description |
|---|---|
| ACI 211.1 | Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete |

American Society for Testing and Materials, ASTM

| Designation | Description |
|---|---|
| ASTM C 94 | Specification For Ready-Mixed Concrete |
| ASTM C 150 | Specification For Portland Cement |
| ASTM C 685 | Concrete Made By Volumetric Batching and Continuous Mixing |
| ASTM C-1260 | Standard Test Method for Potential Alkali Reactivity of Aggregates |
| ASTM D-512 | Test Methods for Chloride Ion in Water |
| ASTM D-516 | Test Methods for Sulfate Ion in Water |
| ASTM D-4191 | Test Method for Sodium in Water by Atomic Absorption |
| ASTM D-4192 | Test Method for Potassium Water by Atomic Absorption |

Texas Department of Transportation: Manual of Testing Procedures

| Designation | Description |
|---|---|
| TEX-203-F | Sand Equivalent Test |
| TEX-401-A | Sieve Analysis of Fine and Coarse Aggregate |
| TEX-406-A | Mineral Finer than 75 µm (No. 200) Sieve in Mineral Aggregates (Decantation Test for Concrete Aggregates) |
| TEX-408-A | Organic Impurities in Fine Aggregate for Concrete |
| TEX-410-A | Abrasion of Coarse Aggregate Using The Los Angeles Machine |

| | |
|---|---|
| TEX-411-A | Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate |
| TEX-413-A | Determination of Deleterious Materials in Mineral Aggregate |
| TEX-415-A | Slump of Portland Cement Concrete |
| TEX-416-A | Air Content of Freshly-Mixed Concrete by the Pressure Method |
| TEX-418-A | Compressive Strength of Cylindrical Concrete Specimens |
| TEX-612-J | Acid Insoluble Residue |

| **SPECIFIC CROSS REFERENCE MATERIALS (Continued)** |
|---|
| **Standard Specification Item 403S, "Concrete For Structures"** |

Texas Department of Transportation: Publications

| Designation | Description |
|---|---|
| Bulletin C-11 | Construction Bulletin |

| **RELATED CROSS REFERENCE MATERIALS** |
|---|
| **Standard Specification Item 403S, "Concrete For Structures"** |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item 360 | Concrete Pavement |
| Item 420 | Concrete Structures |
| Item 421 | Hydraulic Cement Concrete |
| Item 427 | Surface Finishes for Concrete |
| Item 431 | Pneumatically Placed Concrete |

Item 520 Weighing and Measuring Equipment

Texas Department of Transportation: Departmental Material Specifications

| Designation | Description |
|---|---|
| DMS-4650 | Hydraulic Cement Concrete Curing Materials and Evaporation Retardants” |
| DMS-6100 | Epoxy and Adhesives |
| DMS 8900 | Fly Ash |

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**Item No. 410S**
**Concrete Structures**

## 410S.1 Description

This item shall govern the construction of all types of structures involving the use of structural concrete, except where the requirements are waived or revised by other governing specifications.

All concrete structures shall be constructed in accordance with the design requirements and details indicated on the drawings, in conformity with the pertinent provisions of the items contracted for, the incidental items referred to and in conformity with the requirements herein.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

## 410S.2 Submittals

The submittal requirements of this specification item may include:

Appropriate mix designs for class of concrete for each type of structure or unit;

Appropriate mortar and grout mix designs;

Product name, description, technical information and supplier of any acrylic-polymer latex admixture;

Type, supplier and certified test results for expansion joint materials;

Type of waterstop and confirmation that the product conforms to TxDoT DMS-6160;

Type and manufacturer of proposed evaporation retardant and confirmation that it meets the requirements of test results for TxDoT DMS-4650;

Type and manufacturer of proposed chemical admixtures and confirmation that it meets the requirements of test results for TxDoT DMS-4640;

Type and manufacturer of proposed curing admixtures and confirmation that it meets the requirements of test results for TxDoT DMS-4640;

Type and manufacturer of proposed chemical admixtures and confirmation that it meets the requirements of test results for TxDoT DMS-4640;

Type and manufacturer of proposed epoxy and/or adhesives and confirmation that it meets the requirements of test results for TxDoT DMS-6100;

Reinforcing steel shall conform to Standard Specification Item No. 406S, “Reinforcing Steel”.

Contractors formwork plan for placing and consolidating concrete around wall penetrations and at locations designated as having congested reinforcing steel.

## 410S.3 Materials

A. Concrete

Concrete shall conform to Item No. 403S, "Concrete for Structures".

The class of concrete for each type of structure or unit shall be as indicated on the drawings or by pertinent governing specifications.

B. Grout or Mortar

When required or shown on the drawings, mortar and grout consisting of 1 part hydraulic cement and 2 parts sand with sufficient water to provide the desired consistency shall be provided. Mortar shall be provided with a consistency that can be handled easily and spread by a trowel. Grout shall be provided with a consistency that will flow into and completely fill all voids.

C. Latex

When required an acrylic-polymer latex admixture (acrylic resin emulsion in accordance with TxDoT DMS-4640, “Chemical Admixtures for Concrete”) suitable for producing polymer-modified concrete or mortar shall be provided. The latex shall not be allowed to freeze.

The following information shall be submitted for latex:

Name and information of company contact personnel,

Product name and polymer description, and

The latex shall meet the following requirements.

**Table 1: LATEX ADDITIVE REQUIREMENTS**

| Property | Value |
|---|---|
| Total Solids, minimum, percent | 47 |
| PH | 9.0 to 11.0 |
| Brookfield viscosity (# 1 spindle @ 10 rpm), mPas, maximum | 60 |
| Butadiene Content, percent | 30 to 40 |
| Freeze-thaw stability, 2 cycles. maximum | 0.1 |

Specification targets and production tolerances shall also be provided for the following properties.

1. viscosity (including test method and temperature reference),
2. percent solids,
3. pH,
4. specific gravity, and
5. styrene/butadiene ratio.

D. Reinforcing Steel

Reinforcing steel shall conform to Standard Specification Item No. 406S, “Reinforcing Steel”.

E. Expansion Joint Material

The expansion joint material shall conform to the requirements of TxDoT DMS-6310, “Joint Materials and Fillers”.

1. Preformed Fiber Sheets

Unless otherwise indicated on the drawings preformed bituminous fiber material shall be provided. The preformed fiber material shall conform to the dimensions indicated on the drawings. Preformed fiber sheets shall meet the requirements of ASTM D-1751, "Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types). The requirements related to bitumen content, density and water absorption shall not apply to nonbituminous materials.

2. Joint Sealing Material

Unless otherwise indicated on the drawings a Class 4, 5 or 7 low-modulus silicone sealant shall be provided that conforms to the requirements of TxDoT DMS-6310, "Joint Sealants and Fillers".

3. Timber Boards

Timber boards shall be made from redwood or cypress and must be free from sapwood, knots, clustered bird's eye, checks and splits. When oven dried at 230$^{o}$F (110$^{o}$C) to a constant weight (mass), the density of the board shall be between 20 and 35 lbs. Per cubic foot (between 320 and 560 kgs per cubic meter)

4. Asphalt Board

Asphalt Board shall conform to the dimensions indicated on the drawings and shall meet the description, general requirements and distortion testing of ASTM D-994, "Preformed Expansion Joint Filler for Concrete (bituminous Type)".

5. Rebonded Neoprene Filler Sheet

Rebonded neoprene filler shall consist of ground closed cell neoprene particles, rebonded and molded into sheets of uniform thickness of the dimensions indicated on the drawings. These sheets shall meet the requirements of ASTM D-1752, Type I.

The manufacturer shall furnish the Engineer or designated representative with certified test results as to the compliance with the above requirements.

F. Waterstop

Unless otherwise indicated on the drawings, rubber waterstops or Polyvinyl Chloride (PVC) waterstops that conform to TxDoT DMS-6160, "Waterstops, Nylon Reinforced Neoprene Sheet, and Elastomeric Pads" shall be provided.

G. Evaporation Retardants

Evaporation retardants shall conform to the requirements of TxDoT DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants". The evaporation retardant must be a commercially available monomolecular film compound. The evaporation retardant shall have no adverse effect on the cement hydration process or the concrete and shall reduce surface moisture evaporation from the concrete when performing concrete operations in direct sun, wind, high temperatures, or low relative humidity. The producer of the evaporation retardant shall certify that it meets these specified requirements.

H. Curing Materials

1. Liquid Membrane Forming compounds

Liquid Membrane Forming compounds shall conform to the requirements of TxDoT DMS-4650, “Hydraulic Cement Concrete Curing Materials and Evaporation Retardants”. The compound shall be applied to damp concrete as a fine mist through atomizing nozzles at a wet film thickness of 8 to 9 mils (200 to 230 µm). The liquid membrane-forming compound must not react deleteriously with concrete or its components. It must produce a firm, continuous, uniform moisture-impermeable film that is free of pinholes, cracks, or other film defects. It must also exhibit satisfactory adhesion.

The consistency must be such that the compound can be applied satisfactorily by conventional or airless spray at atmospheric and material temperatures above 40$^{o}$F (5$^{o}$C) without thinning. When applied at the manufacturer's recommended thickness, not less than 8 mils (200 µm) wet, to vertical surfaces of damp concrete, the compound must not run off or appreciably sag. The liquid membrane-forming compound must not disintegrate, check, peel, or crack during the required curing period. It must not peel or pick up under traffic, and must disappear from the surface of the cured concrete by gradual disintegration.

2. Cotton Mats

Cotton mats shall consist of a filling material of cotton “bat” or “bats” [at least 12 oz. Per square yard (400 grams per square meter)] completely covered with unsized cloth [at least 6 oz. Per square yard (200 grams per square meter)] stitched longitudinally with continuous parallel rows of stitching spaced at less than 4 in. (100 mm), or tuft both longitudinally and transversely at intervals less than 3 in. (75 mm).

The cotton mats shall be free from tears and in good general condition. A flap at least 6 in. (150 mm) wide with two (2) thicknesses of the covering that extends along one side of the mat shall be provided.

3. Polyethylene Sheeting

The polyethylene sheeting shall be at least 4 mils thick (0.1 mm) and free from visible defects. Clear or opaque white sheeting shall be provided when the ambient temperature during curing exceeds 60$^{o}$F (15$^{o}$C) or when applicable to control temperature during mass pours.

4. Burlap-Polyethylene Mats

The burlap-polyethylene mats shall be made from burlap impregnated on 1 side with a film of opaque white-pigmented polyethylene, free from visible defects. The laminated mats shall have at least 1 layer of an impervious material such as polyethylene, vinyl plastic, or other acceptable material (either as a solid sheet or impregnated into another fabric) and shall be free of visible defects.

I. Chemical Admixtures

Chemical admixtures including water reducing, placticizers and air entrainment shall conform to TxDoT DMS-4640, “Chemical Admixtures for Concrete” Calcium chloride shall not be used. Admixtures shall be included in the prequalified concrete admixtures list maintained by TxDot’s Construction Division.

J. City of Austin Survey Monuments

The Public Works Department may furnish permanent survey monuments to be cast in concrete as indicated on the drawings or as directed by the Engineer or designated representative.

K. Epoxy

Unless indicated otherwise on the drawings, epoxy materials shall conform to TxDoT DMS-6100, “Epoxy and Adhesives”.

**410S.4 General Requirements**

Before starting work, the Contractor shall inform the Engineer or designated representative fully of the construction methods the Contractor proposes to use, the adequacy of which shall be subject to the review by the Engineer or designated representative. Drawings for forms and falsework for piers and superstructure spans over 20 feet (6 meters) long, bracing systems for girders when the overhang exceeds 3 ft. 6 in. (1 meter) and for all bridge widening details shall be submitted to the Engineer or designated representative for review, if requested. Similar drawings shall be submitted for other units of the structure, if requested by the Engineer or designated representative. The drawings shall be prepared on standard 22 inch by 36-inch (550mm by 900 mm) sheets and shall show all essential details of the proposed forms, falsework and bracing to permit a structural analysis. Four sets of such drawings will be required.

Concurrence on the part of the Engineer or designated representative in any proposed construction methods, approval of equipment or of form and falsework drawings does not relieve the Contractor of the responsibility for the safety or correctness of the Contractor’s methods, adequacy of equipment or from carrying out the work in full accordance with the contract.

Unless otherwise indicated on the drawings, the requirements in the succeeding paragraphs shall govern the time sequence in which construction operations may be carried on and for the opening of completed structures to traffic:

Superstructure members, forms, falsework or erection equipment shall not be placed on the substructure before the concrete therein has attained a 3000 psi (20.7 MPa) compressive strength.

Storage of materials on completed portions of a structure will not be permitted until all curing requirements for those particular portions have been met.

No forms shall be erected on concrete footings supported by piling or drilled shafts until the concrete therein has attained a minimum compressive strength of 2500 psi (17.2 MPa). Such work may begin on spread footings after the therein has aged at least 2 curing days. Concrete may be placed as soon as the forms and reinforcing steel are approved by the Engineer or designated representative.

The support of tie beam and/or forms by falsework placed on previously placed tie beams is permissible provided such beams have attained 3000 psi (20.7 MPa) compressive strength, curing requirements are completed and the beams are properly supported to eliminate stresses not provided for in the design.

Bridges and direct traffic culverts shall not be opened to construction traffic or to the traveling public until authorized by the Engineer or designated representative in accordance with the following:

Authorization may be given after the last slab concrete has been in place at least 14 days for light construction traffic not to exceed a 3/4-ton (0.68 Mg) vehicle.

Authorization to place embankments to allow normal construction traffic and when necessary to the traveling public, may be given after the last slab concrete has been in place 30 days or when the minimum compressive strength ($f_c'$) has reached the 28 day strength conforming to Item No. 403S, "Concrete for Structures" or as indicated on the drawings.

### 410S.5 Drains

Weep holes and roadway drains shall be installed and constructed as indicated on the drawings.

### 410S.6 Expansion Joints

Joints and devices shall be used to provide for expansion and contraction of concrete slabs and shall be constructed as indicated on the drawings.

The bearing area under the expansion ends of concrete slabs and slab and girder spans shall be given a steel trowel finish and finished to the exact grades required on the drawings. The material used to separate expansion surfaces shall be as indicated on the drawings and placed so that concrete or mortar cannot be subsequently worked around or under it. The bridging of concrete or mortar around expansion joint material in bearings and expansion joints shall be prevented.

Concrete adjacent to armor joints and finger joints shall be placed carefully to avoid defective anchorage and porous or honeycombed concrete in such areas.

All open joints and joints to be filled with expansion joint material shall be constructed using forms adaptable to loosening or early removal. To avoid expansion or contraction damage to the adjacent concrete, these forms shall be loosened as soon as possible after final concrete set to permit free movement of the span without requiring full form removal.

Preformed fiber joint material or other material indicated shall be used in the vertical joints of the roadway slab, curb, median or sidewalk. The top 1-inch (25 mm) thereof shall be filled with joint sealing material, as specified herein. The sealer shall be installed in accordance with Standard Specification Item No. 413S, “Cleaning and/or Sealing Joints and Cracks (PC Concrete)” and the manufacturer’s recommendations.

Prior to placing the sealing material, the vertical faces of the joint shall be cleaned of all laitance by sandblasting or by mechanical routing. Cracked or spalled edges shall be repaired. The joint shall be blown clean of all foreign material and sealed.

Where preformed fiber joint material is used, it shall be anchored to the concrete on one side of the joint by light wire or nails to prevent the material from falling out.

Finished joints shall conform to the drawing details with the concrete sections completely separated by the specified opening or joint material.

Soon after form removal and where necessary after surface finishing, all projecting concrete shall be removed along exposed edges to secure full effectiveness of the expansion joints.

**410S.7 Construction Joints**

The joint formed by placing plastic concrete in direct contact with concrete that has attained its initial set shall be deemed a construction joint. The term monolithic placement shall be interpreted to mean that the manner and sequence of concrete placing shall not create construction joints.

Construction joints shall be of the type and at the locations indicated on the drawings. Additional joints will not be permitted without written authorization from the Engineer or designated representative and when authorized, shall have details equivalent to those indicated for joints in similar locations.

Unless otherwise provided, construction joints shall be square and normal to the forms. Bulkheads shall be provided in the forms for all joints, except when horizontal. All vertical construction joints shall be chamfered. All horizontal construction joints shall be routed or grooved.

Construction joints requiring the use of joint sealing material shall be as indicated on the drawings or as directed by the Engineer or designated representative. The material will be indicated on the drawings without reference to joint type.

A concrete placement terminating at a horizontal construction joint shall have the top surface roughened thoroughly as soon as practicable after initial set is attained. The surfaces at bulkheads shall be roughened as soon as the forms are removed.

The hardened concrete surface shall be thoroughly cleaned of all loose material, laitance, dirt or foreign matter and saturated with water so it is moist when placing fresh concrete against it. Remove all free water and moisten the surface before concrete or bonding grout is placed against it. Forms shall be drawn tight against the existing concrete and the joint surface flushed with grout just prior to placing the fresh concrete.

The joint surface shall be coated with bonding mortar, grout, epoxy or other material as indicated on the drawings or other items. A Type V epoxy shall be provided in accordance with TxDoT DMS-6100, “Epoxies and Adhesives” for bonding fresh concrete to hardened concrete. The epoxy shall be placed on a clean dry surface and the fresh concrete shall be placed while the epoxy is still tacky. Bonding mortar or grout shall be placed on a surface that is saturated surface dry and the concrete shall be placed before the bonding mortar or grout dries. Other bonding agents shall be placed in accordance with the manufacturer’s recommendations.

**410S.8 Foundation and Substructure**

Excavation for foundations and substructure shall conform to Standard Specification Item No. 401S, "Structural Excavation and Backfill".

Concrete for foundation seals, unless otherwise indicated on the drawings, shall be Class C Concrete with a coarse aggregate grade of 2, 3, 4 or 5 and placed in accordance with the requirements herein. The top of the completed seal shall not vary from plan grade or the grade established by the Engineer or designated representative.

Where a concrete seal is indicated on the Drawings, the design will be based on the normal water elevation as indicated on the Drawings. If the foundation concrete can be placed in the dry at the time of construction, the seal will not be required. If additional seal is necessary for the conditions existing during the time of construction, its thickness shall be increased as deemed necessary by the Contractor and at the Contractor's expense. If the conditions existing at the time of construction require a seal for placing the foundation concrete in the dry and none is indicated on the Drawings, the Contractor shall place an adequate seal at the Contractor's expense.

The seal shall be allowed to set for at least 36 hours before the caisson or cofferdam is dewatered, after which the top of the seal shall be cleaned of all laitance or other soft material and all high spots exceeding the above limitation shall be cut off and removed.

### 410S.9 Falsework

The Contractor is totally responsible for all falsework. The Contractor shall design and construct it to safely carry the maximum anticipated loads and to provide the necessary rigidity. Details of falsework construction shall be subject to review by the Engineer or designated representative, but Engineer's review shall in no way relieve the Contractor of responsibility of the adequacy and safety of the falsework design.

All timber used in falsework centering shall be sound, in good condition and free from defects which will impair its strength. When wedges are used to adjust falsework to desired elevations, they shall be used in pairs to insure even bearing.

Sills or grillages shall be large enough to support the superimposed load without settlement and unless founded on solid rock, shale or other hard materials, precautions shall be taken to prevent yielding of the supporting material.

Falsework, which cannot be founded on a satisfactory spread footing, shall be placed on piling driven to a bearing capacity sufficient to support the superimposed load without settlement. The safe bearing capacity of piling shall be determined by test loads or by such other methods that may be required or acceptable to the Engineer or designated representative.

In general, each falsework bent shall be capped transversely by a member of proper size. A short cap section forming a T-head may be substituted to permit the removal of portions of the forms without disturbing the falsework. Caps shall be securely fastened to each pile or column in the bent and set at the proper elevation to produce, in conjunction with the use of approved wedges or jacks, permanent camber indicated on the Drawings, plus a construction camber covering allowance for deformation of the forms and falsework. The use of wedges to compensate for incorrectly cut bearing surfaces will not be permitted. Each falsework bent shall be securely braced to provide the stiffness required with the bracing securely fastened to each pile or column it crosses.

In setting falsework for arches, allowances shall be made for settlement of falsework, deflection of the arch and permanent camber. Provision shall be made by suitable wedges, sand jacks or other acceptable devices for the controlled lowering of falsework when the arch is swung. Falsework may be required to be placed on jacks to provide for settlement correction during concrete placement.

When the falsework is no longer required, it shall be removed. Falsework piling shall be pulled or cut off not less than 2 feet (0.6 meter) below finished ground level. Falsework and piling in a stream, lake or bay shall be completely removed to a point specified by the Engineer or designated representative to prevent any obstruction to the waterway.

**410S.10 Forms**

Forms for precast prestressed concrete members and for prestressed piling shall be constructed conforming to Item No. 425S, "Prestressed Concrete Structures".

A. General

Except where otherwise indicated on the drawings, forms may be of either timber or metal.

Forms for round columns exposed to view shall be of steel, except that other materials will be allowed with written permission of the Engineer or designated representative.

Forming plans shall be submitted for approval by the Engineer or designated representative. Forms shall be designed for the pressure exerted by a liquid weighing 150 pounds per cubic foot (2.4 Mega grams per cubic meter). The rate of placing the concrete shall be taken into consideration in determining the depth of the equivalent liquid. For job-fabricated forms an additional live load of 50 pounds per square foot (1.675 MPa) shall be allowed on horizontal surfaces. The maximum unit stresses shall not exceed 125 percent of the allowable stresses used by the Engineer or designated representative for the design of structures.

Formwork for wall and/or column pours equal or exceeding 8 feet (2.44 meters) shall be designed in accordance with ACI 347, “Guide to Formwork for Concrete” and sealed by a Registered Civil Engineer Licensed in the State of Texas, who is experienced in formwork design.

Commercially produced structural units used in formwork shall not exceed the manufacturer's maximum allowable working load for moment, shear or end reaction. The maximum working load shall include a live load of 35 pounds per square foot (1.175 MPa) of horizontal form surface and sufficient details and data shall be submitted for use in checking formwork details for approval.

Forms shall be practically mortar-tight, rigidly braced and strong enough to prevent bulging between supports and maintained to the proper line and grade during concrete placement. Forms shall be maintained in a manner that will prevent warping and shrinkage.

Deflections due to cast-in-place slab concrete and railing shown in the dead load deflection diagram shall be taken into account in the setting of slab forms.

All forms and footing areas shall be cleaned of any extraneous matter before placing concrete.

Permission to place concrete will not be given until all of such work is complete to the satisfaction of the Engineer or designated representative.

If, at any stage of the work, the forms show signs of bulging or sagging, the portion of the concrete causing such condition shall be removed immediately, if necessary and the forms shall be reset and securely braced against further movement.

B. Timber Forms

Lumber for forms shall be properly seasoned, of good quality and free from imperfections, which would affect its strength or impair the finished surface of the concrete. The lumber used for facing or sheathing shall be finished on at least 1 side and 2 edges and shall be sized to uniform thickness.

Form or form lumber that will be reused shall be maintained clean and in good condition. Lumber that is split, warped, bulged, or marred or that has defects that will produce inferior forms shall not be used but shall be removed from the work.

Form lining will be required for all formed surfaces, except for the inside of culvert barrels, inlets, manholes and box girders, the bottom of bridge decks between beams or girders, surfaces that are subsequently covered by backfill material or are completely enclosed and any surface formed by a single finished board. Lining will not be required when plywood forms are used.

Form lining shall be of an approved type such as masonite or plywood. Thin membrane sheeting such as polyethylene sheets shall not be used for form lining.

Forms may be constructed of plywood not less than ¾ inch (19 mm) in thickness, with no form lining required. The grain of the face plies on plywood forms shall be placed parallel to the span between the supporting studs or joists.

Plywood used for forming surfaces, which remain exposed, shall be equal to that specified as B-B Plyform Class I or Class II Exterior of the U.S. Department of Commerce Voluntary Product Standard, PS 1.

Studs and joists shall be spaced so that the facing form material remains in true alignment under the imposed loads.

Wales shall be spaced close enough to hold forms securely to the designated lines and scabbed at least 4 feet (1.22 meters) on each side of joints to provide continuity. A row of wales shall be placed near the bottom of each placement.

Facing material shall be placed with parallel and square joints and securely fastened to supporting studs.

Forms for surfaces receiving only an ordinary finish and exposed to view shall be placed with the form panels symmetrical, i.e., long dimensions set in the same direction. Horizontal joints shall be continuous.

Molding specified for chamfer strips or other uses shall be made of materials of a grade that will not split when nailed and which can be maintained to a true line without warping. Wood molding shall be mill cut and dressed on all faces. Unless indicated otherwise on the drawings, forms shall be filleted at all sharp corners and edges with triangular chamfer strips measuring 3/4 inch (19 mm) on the sides.

Forms for railings and ornamental work shall be constructed to standards equivalent to first class millwork. All moldings, panel work and bevel strips shall be straight and true with neatly mitered joints designed so the finish work is true, sharp and clean cut. All forms shall be constructed to permit their removal without marring or damaging the concrete. The forms may be given a slight draft to permit ease of removal.

Metal form ties of an approved type or a satisfactory substitute shall be used to hold forms in place and shall be of a type that permits ease of removal of the metal as hereinafter specified.

All metal appliances used inside of forms for alignment purposes shall be removed to a depth of at least 1/2 inch (13 mm) from the concrete surface. They shall be made so the metal may be removed without undue chipping or spalling and when removed, shall leave a smooth opening in the concrete surface. Burning off of rods, bolts or ties will not be permitted.

Any wire ties used shall be cut back at least 1/2 inch (13 mm) from the face of the concrete and properly patched.

Devices holding metal ties in place shall be capable of developing the strength of the tie and adjustable to allow for proper alignment.

Metal and wooden spreaders, which are separate from the forms, shall be removed entirely as the concrete is being placed.

Adequate clean-out openings shall be provided for narrow walls and other locations where access to the bottom of the forms is not readily attainable.

Prior to placing concrete, the facing of all forms shall be treated with oil or other bond breaking coating of such composition that it will not discolor or otherwise injuriously affect the concrete surface. Care shall be exercised to prevent coating of the reinforcing steel.

C. Metal Forms

The foregoing requirements for timber forms as regards design, mortar-tightness, filleted corners, beveled projections, bracing, alignment, removal, reuse and wetting shall also apply to metal forms, except that these will not require lining, unless specifically indicated on the drawings.

The thickness of form metal shall be as required to maintain the true shape without warping or bulging. All bolt and rivet heads on the facing sides shall be countersunk. Clamps, pins or other connecting devices shall be designed to hold the forms rigidly together and to allow removal without injury to the concrete. Metal forms, which do not present a smooth surface or line up properly, shall not be used. Metal shall be kept free from rust, grease or other foreign materials.

D. Form Supports for Overhang Slabs

Form supports which transmit a horizontal force to a steel girder or beam or to a prestressed concrete beam will be permitted, but shall not be used unless a structural analysis has been made of the affect on the girder or beam and approval is granted by the Engineer or designated representative.

In normal or skewed spans with standard overhangs not exceeding 3 feet, 1 1/2 inches (0.95 meter), beam bracing as shown in the drawings shall be used.

Spans in which the overhang width exceeds 3 feet, 1 1/2 inches (0.95 meter) will require additional support for the outside beams to resist torsion. Details of the Contractor's proposed method of providing additional support shall be included with the slab forming plans submitted to the Engineer or designated representative for review and approval.

Holes in steel members for support of overhang brackets may be punched or drilled full size or may be torch cut to 1/4 inch (6 mm) under size and reamed full size. In no case shall the holes be burned full size. The hole shall be left open unless indicated to be filled with a button head bolt. They shall never be filled by welding.

**410S.11 Placing Reinforcement**

Reinforcement in concrete structures shall be placed carefully and accurately and rigidly supported as provided in Standard Specification Item No. 406S, "Reinforcing Steel". Reinforcing steel supports shall not be welded to I-beams or girders or stirrups of prestressed concrete beams.

**410S.12 Placing Concrete**

A. General

Concrete shall not be placed when impending weather conditions would impair the quality of the finished work. If conditions of wind, humidity and temperature are such that concrete cannot be placed without the potential for shrinkage cracking, the concrete should be placed in early morning, at night or on a schedule with more favorable weather. When mixing, placing and finishing concrete is scheduled during non-daylight hours; the entire placement site should be illuminated to the satisfaction of the Engineer or designated representative.

If changes in weather conditions require protective measures after work starts, adequate shelter shall be provided to protect the concrete against damage from rainfall or from freezing temperatures as outlined in this Item. Operations during rainfall shall only be continued if approved by the Engineer or designated representative. Aggregate stockpiles shall be covered to the extent necessary to control the moisture conditions in the aggregates.

Slab concrete shall be mixed in a plant located off the structure. Carting or wheeling concrete batches over completed slabs will not be permitted until they have aged at least 4 full curing days or timber planking placed on top of the slab for the carts to traverse along. Carts shall be equipped with pneumatic tires. Curing operations shall not be interrupted for the purpose of wheeling concrete over finished slabs.

Exposed concrete surfaces, while still plastic, shall be stamped with an impression having the Contractor's name, the month and year. The stamp shall be of an approved design.

At least 1 day of curing shall be allowed after the concrete has achieved initial set before placing strain on projecting reinforcement to prevent damage to the concrete.

The storing of reinforcing or structural steel on completed roadway slabs generally shall be avoided and when permitted, shall be limited to quantities and distribution that will not induce excessive stresses.

B. Preparation of Surfaces

All forms, prestressed concrete panels, T-beams and concrete box beams on which concrete will be placed shall be thoroughly wetted before the placement of concrete. Puddles of excess water shall be removed before placing the concrete. The various surfaces shall be in a moist, saturated surface dry condition when concrete is placed on or against them.

The subgrade or foundation shall be moist before placing concrete for bridge approach slabs or other concrete placed on grade. If dry the subgrade shall be lightly sprinkled.

C. Placing Temperature

The minimum temperature of all concrete at the time of placement shall not be less than 50$^{o}$F (10$^{o}$C). The maximum temperature of any concrete, unless otherwise indicated on the drawings, shall not exceed 95$^{o}$F (35$^{o}$C) when placed. The maximum temperature of cast-in-place concrete in bridge superstructures, diaphragms, parapets, concrete portions of railing, curbs and sidewalks and direct traffic box culverts shall not exceed 85$^{o}$F (30$^{o}$C) when placed. Other portions of structures, when indicated on the drawings, shall require the temperature control specified.

For continuous placement of the deck on continuous steel units, the initial set of the concrete shall be retarded sufficiently to insure that it remains plastic in not less than 3 spans immediately preceding the one being placed. For simple spans, retardation shall be required only if necessary to complete finishing operations.

The consistency of the concrete as placed should allow the completion of all finishing operations without the addition of water to the surface. When conditions are such that additional moisture is needed for finishing, the required water shall be applied to the surface by fog spray only and shall be held to a minimum amount. Fog spray for this purpose may be applied with hand operated fogging equipment.

The height of free fall of concrete shall be limited to 5 feet (1.575 meters) to prevent segregation.

D. Transporting Time

The maximum time interval between the addition of cement to the batch and the placing of concrete in the forms shall not exceed the following:

| **Table 2: Allowable Transportation Times** | | | |
|---|---|---|---|
| Air or ConcreteTemperature whichever is higher | Maximum Time w/o Retarder | Maximum Time with Retarder | |
| | | *Specific Applications | All others |
| Non-agitated Concrete | | | |
| 35°F to 79°F (2°C to 26°C) | 45 minutes | 45 minutes | 45 minutes |
| Over 80°F (Over 25°C) | 30 minutes | 45 minutes | 45 minutes |
| Agitated Concrete | | | |
| 90°F (32°C) or above | 45 minutes | 75 minutes | 105 minutes |
| 75°F to 89°F (24°C to 32°C) | 60 minutes | 90 minutes | 120 minutes |
| 35°F to 74°F (2°C to 23°C) | 90 minutes | 120 minutes | 150 minutes |

* Specific applications include Bridge decks, cased drilled shafts and slabs of direct traffic culverts

The use of an approved retarding agent in the concrete will permit the extension of each of the above temperature-time maximums by 30 minutes for bridge decks, top slabs of direct traffic culverts and cased drilled shafts and 1 hour for all other concrete except that the maximum time shall not exceed 45 minutes for non-agitated concrete.

E. Handling and Placing

The Contractor shall give the Engineer or designated representative sufficient advance notice before placing concrete in any unit of the structure to permit the review of forms, reinforcing steel placement and other preparations. Concrete shall not be placed in any unit prior to the completion of formwork and placement of reinforcement therein.

The sequence for placing concrete shall be as indicated on the drawings or as required herein. The placing shall be regulated so the pressures caused by the plastic concrete shall not exceed the loads used in the form design.

The method of handling, placing and consolidation of concrete shall minimize segregation and displacement of the reinforcement and produce a uniformly dense and compact mass. Concrete shall not have a free fall of more than 5 feet (1.5 meters), except in the case of drilled shafts, thin wall sections such as in culverts, or as allowed by other Items. Any hardened concrete spatter ahead of the plastic concrete shall be removed.

Each part of the forms shall be filled by depositing concrete as near its final position as possible. The coarse aggregate shall be worked back from the face and the concrete forced under and around the reinforcement bars without displacing them. Depositing large quantities at one point and running or working it along the forms will not be allowed.

Concrete shall be deposited in the forms in layers of suitable depth but not more than 36 inches (0.9 meter) in thickness, unless otherwise directed by the Engineer or designated representative.

Cold joints in a monolithic placement shall be avoided. The sequence of successive layers or adjacent portions of concrete shall be such that they can be vibrated into a homogeneous mass with the previously placed concrete without a cold joint. Not more than 1 hour (1 ½ hours if a normal dosage of retarding admixture is used) shall elapse between adjacent or successive placements of concrete. Unauthorized construction joints shall be avoided by placing all concrete between the authorized joints in one continuous operation.

An approved retarding agent shall be used to control stress cracks and/or authorized cold joints in mass placements where differential settlement and/or setting time may induce stress cracking, such as on false work, in deep girder stems, etc.

Openings in forms shall be provided, if needed, for the removal of laitance or foreign matter of any kind.

All forms shall be wetted thoroughly before the concrete is placed therein.

F. Consolidation

All concrete shall be carefully consolidated and the mortar flushed to the form surfaces by continuous working with immersion type vibrators. Vibrators which operate by attachment to forms or reinforcement will not be permitted, except on steel forms. At least 1 standby vibrator shall be provided for emergency use in addition to the ones required for placement. For lightweight concrete, vibrators of the high frequency type, which produce a minimum of 7000 impulses per minute, will be required.

The concrete shall be vibrated immediately after deposition. Prior to the beginning of work, a systematic spacing of the points of vibration shall be established to insure complete consolidation and thorough working of the concrete around the reinforcement, embedded fixtures and into the corners and angles of the forms. Immersion type vibrators shall be inserted vertically, at points 18 to 30 inches (450 to 750 mm) apart and slowly withdrawn. The vibrator may only be inserted in a sloping or horizontal position in shallow slabs. The entire depth of each lift shall be vibrated, allowing the vibrator to penetrate several inches (several cms) into the preceding lift. The vibrator shall not be used to move the concrete to other locations. In addition the vibrator shall not be dragged through the concrete. Concrete along construction joints shall be thoroughly consolidated by operating the vibrator along and close to but not against the joint surface. The vibration shall continue until thorough consolidation and complete embedment of reinforcement and fixtures is produced, but not long enough to cause segregation. Vibration may be supplemented by hand spading or rodding, if necessary, to insure the flushing of mortar to the surface of all forms.

G. Finishing

From the time of initial strike off until final finish is completed and required interim curing is in place, the unformed surfaces of slab concrete in bridge decks and top slab of direct traffic culverts and concrete slabs, shall be kept damp, not wet, to offset the effects of rapid evaporation of mixing water from the concrete due to wind, temperature, low humidity or combinations thereof. Fogging equipment capable of applying water in the form of a fine fog mist, not a spray, will be required. Fogging will be applied at the times and in the manner directed by the Engineer or designated representative.

Fogging equipment may be either water pumped under high pressure or a combination of air and water, either system in combination with a proper atomizing nozzle. The equipment shall be sufficiently portable for use in the direction of any prevailing winds. The equipment shall be adapted for intermittent use to prevent excessive wetting of the surfaces.

Upon completion of the final finish, interim curing will be required for slab concrete in bridge decks and top slabs of direct traffic culverts as follows:

(1) Required water curing shall begin as soon as it can be done without damaging the concrete finish.

(2) Unless otherwise indicated on the Drawings, Type 1-D membrane curing compound that conforms to TxDoT DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants" shall be applied to the slab surface.

H. Installation of Dowels and Anchor Bolts

Dowels and anchor bolts shall be installed by casting them in place or by grouting with grout, epoxy, or epoxy mortar unless indicated otherwise on the drawings.

Holes for grouting shall be formed or drilled. Holes for anchor bolts shall be drilled to accommodate the bolt embedment required on the drawings. Holes for dowels shall be made at least 12 in. (300 mm) deep unless indicated otherwise on the drawings. When grout or epoxy mortar is specified the diameter of the hole shall be at least twice the dowel or bolt diameter but shall not exceed the dowel or bolt diameter plus 1 ½ in (38 mm). When epoxy is specified the hole diameter should be 1/16 to ¼ in. (1.6 to 6.35 mm) greater than the dowel or bolt diameter.

Holes for anchor bolts in piers, abutments, bents or pedestals may be drilled or formed by the insertion of oiled wooden plugs or metal sleeves in the plastic concrete. Formed holes shall be large enough to permit horizontal adjustments of the bolts. The bolts shall be carefully set in mortar. In lieu of the above, anchor bolts may be set to exact locations when the concrete is placed.

The holes shall be thoroughly cleaned of all loose material, oil, grease or other bond-breaking substance and blow them clean with filtered compressed air. When an epoxy type material is used the holes shall be in a surface dry condition. When hydraulic cement grout is used the holes shall be in a surface moist condition. The void space between the hole and the dowel or bolt shall be completely filled with grouting material. The requirements for cleaning outlined in the product specification for prepackaged systems shall be followed exactly.

The following should be used as a guide in selection of an appropriate grout, mortar, epoxy or epoxy grout.

Table 3: Guide for Selection of Epoxy, Epoxy Mortar, Grout and Epoxy Grout

| Material Type | Recommendation |
|---|---|
| Epoxy, Epoxy Mortar or other prepackaged Mortar | As Approved |
| Cast-in-place or Grouted system | 1 part hydraulic cement, 2 parts sand and |

| | |
|---|---|
| | sufficient water for desired consistency |
| Neat Epoxy | Type III epoxy per TxDoT DMS-6100, "Epoxies and Adhesives" |
| Epoxy Grout | Type III epoxy per TxDoT DMS-6100, "Epoxies and Adhesives" |
| Provide grout, epoxy or epoxy mortar as the binding agent unless otherwise indicated on the drawings | |

**410S.13 Placing Concrete in Cold Weather**

A. General

The Contractor is responsible for the protection of concrete placed under any and all weather conditions and is responsible for producing concrete equal in quality to that placed under normal conditions. Permission given by the Engineer or designated representative to allow placement of the concrete during cold weather does not relieve the Contractor of the responsibility for producing concrete equal in quality to that placed under normal conditions. Concrete placed under adverse weather conditions that proves to be unsatisfactory shall be removed and replaced at Contractor' expense.

B. Cast-in-Place Concrete

Concrete may be placed when the ambient temperature is not less than 35$^{o}$F (2$^{o}$C) in the shade and rising or above 40$^{o}$F (4$^{o}$C). Concrete shall not be placed when the ambient temperature in the shade is below 40$^{o}$F (4$^{o}$C) and falling unless approved by the Engineer or designated representative. Concrete shall not be placed in contact with any material coated with frost or having a temperature less than 32$^{o}$F (0$^{o}$C).

Aggregates shall be free from ice, frost and frozen lumps. When required, in order to produce the minimum specified concrete temperature; the aggregate and/or the water shall be heated uniformly, in accordance with the following:

The water temperature shall not exceed 180$^{o}$F(82$^{o}$C) and/or the aggregate temperature shall not exceed 150$^{o}$F(66$^{o}$C). The heating apparatus shall heat the mass of aggregate uniformly. The temperature of the mixture of aggregates and water shall be between 50$^{o}$F(10$^{o}$C) and 85$^{o}$F(29$^{o}$C) before introduction of the cement.

All concrete shall be effectively protected as follows:

1. The temperature of slab concrete of all unformed surfaces shall be maintained at 50$^{o}$F(10$^{o}$C) or above for a period of 72 hours from time of placement and above 40$^{o}$F(4$^{o}$C) for an additional 72 hours.
2. The temperature at the surface of all concrete in bents, piers, culvert walls, retaining walls, parapets, wingwalls, bottom of slabs and other similar forms shall be maintained at 40$^{o}$F(4$^{o}$C) or above for a period of 72 hours from time of placement.
3. The temperature of all concrete, including the bottom slabs of culverts placed on or in the ground, shall be maintained above 32$^{o}$F(0$^{o}$C) for a period of 72 hours from time of placement.

Protection shall consist of providing additional covering, insulated forms or other means and if necessary, supplementing such covering with artificial heating. Avoid applying heat directly to concrete surfaces. Curing shall be provided during this period until all requirements for curing have been satisfied.

When impending weather conditions indicate the possibility of the need for such temperature protection, all necessary heating and covering material shall be on hand ready for use before permission is granted to begin placement.

Sufficient extra test specimens will be made and cured with the placement to ascertain the condition of the concrete as placed prior to form removal and acceptance.

C. Precast Concrete

A fabricating plant for precast products which has adequate protection from cold weather in the form of permanent or portable framework and covering, which protects the concrete when placed the forms and is equipped with approved steam curing facilities may place concrete under any low temperature conditions provided:

1. The framework and covering are placed and heat is provided for the concrete and the forms within 1 hour after the concrete is placed. This shall not be construed to be 1 hour after the last concrete is placed, but that no concrete shall remain unprotected longer than 1 hour.
2. Steam heat shall keep the air surrounding the concrete between 50$^{o}$F (10$^{o}$C) and 85$^{o}$F(29$^{o}$C) for a minimum of 3 hours prior to beginning the temperature rise, which is required for steam curing.

**410S.14 Placing Concrete in Hot Weather**

When the temperature of the air is above 85ºF (29$^{o}$C), an approved retarding agent will be required in all exposed concrete, concrete used in superstructures, top slabs of direct traffic culverts and all cased drilled shafts regardless of temperatures. Concrete mix temperatures shall not exceed 90ºF (32$^{o}$C) except for mixes that include high range water reducers where a maximum mix temperature of 100ºF (38$^{o}$C) will be allowed.

If the concrete mix temperature is expected to exceed 90ºF (32$^{o}$C) (or 100ºF (38$^{o}$C) in mixes with high range water reducers) ice may be utilized to lower the concrete mix temperature. Ice may be added to the concrete mix as a portion by weight of the mix water. However the addition of ice shall not exceed 50% of the total mix water weight.

When weather conditions are such that the addition of ice at 50% of the mix water is not sufficient to reduce the concrete mix temperature to an acceptable temperature, concrete work shall not be allowed.

When ice is to be used in hot weather concrete placement, the Contractor shall furnish a mix design (Section 4.4 of Standard Specification Item 360S, “Concrete Pavement” and Section 6 of Standard Specification Item No. 403S, “Concrete for Structures”) acceptable to the Engineer or designated representative for class of concrete specified on the drawings.

**410S.15 Placing Concrete in Water**

Concrete shall be deposited in water only when indicated on the drawings or with written permission of the Engineer or designated representative. The forms, cofferdams or caissons shall be sufficiently tight to prevent any water current passing through the space in which the concrete is being deposited. Pumping will not be permitted during the concrete placing nor until it has set for at least 36 hours.

The concrete shall be placed with a tremie, pump or other approved method and shall not be permitted to fall freely through the water nor shall it be disturbed after it has been placed. Its surface shall be kept approximately level during placement.

The tremie shall be supported or the pump operated so that it can be easily moved horizontally to cover all the work area and vertically to control the concrete flow. The lower end of the tremie or pump hose shall be submerged in the concrete at all times.

The placing operations shall be continuous until the work is complete.

For concrete to be placed under water, the concrete mix shall be designed in accordance with Standard Specification Item No. 403S, “Concrete For Structures” with a minimum cement content of 650 lb. Per cubic yard (10.4 Mg per cubic meter). An anti-wash admixture may be included in the mix design as necessary to produce a satisfactory finished product.

### 410S.16 Placing Concrete in Superstructure

A. General

Unless otherwise indicated on the drawings, simple span roadway slabs shall be placed without transverse construction joints by using a mechanical longitudinal screed or a self-propelled transverse finishing machine or a mechanical longitudinal screed. For small placements or unusual conditions such as narrow widening, variable cross-slopes, or transitions, manually operated screeding equipment may be used if approved by the Engineer or designated representative.

B. Transverse Screeding

Unless otherwise indicated on the drawings, slabs on continuous units shall be placed in one continuous operation without transverse construction joints using a longitudinal screed or a self-propelled transverse finishing machine. Rails for transverse finishing machines supported from the beams or girders shall be installed so they may be removed without damage to the slab. Bond between removable supports and the concrete shall be prevented in a manner acceptable to the Engineer or designated representative. Rail support parts, which remain embedded in the slab, shall not project above the upper mat of reinforcing steel. Rail or screed supports attached to I-beams or girders shall be subject to "General Requirements" stated above. Unless indicated otherwise on the drawings, the minimum rate of concrete placement is 30 lineal feet (9.144 lineal meters) of bridge slab per hour. The concrete shall be deposited parallel to the skew of the bridge so that all girders are loaded uniformly along their length. Slab concrete shall be deposited between the exterior beam and the adjacent beam before placing concrete in the overhang portion of the slab. Personnel and equipment shall be furnished that is capable of placing, finishing and curing the slab at an acceptable rate to ensure compliance with this Item. Concrete shall be placed in transverse strips. On profile grades greater than 1.5 %, placement shall be started at the lower end.

C. Longitudinal Screeding

The screed shall be adequately supported on a header or rail system sufficiently stable to withstand the longitudinal or lateral thrust of the equipment. Unless otherwise indicated on the drawings, temporary intermediate headers will be permitted for placements exceeding 50 feet (15.24 meters) in length for the longitudinal screed, provided the rate of placement is rapid enough to prevent a cold joint and these headers are designed for early removal to permit satisfactory consolidation and finish of the concrete at their locations. The slab concrete shall be deposited between the exterior beam and the adjacent beam before placing concrete in the overhang portion of the slab.

For longitudinal screeding, concrete shall be placed in longitudinal strips starting at a point in the center of the segment adjacent to one side, except as provided herein and the strip completed by placing uniformly in both directions toward the ends except that for spans on a grade of 1.5 percent or more, placing shall start at the lower end. The width of strips shall be such that the concrete therein will remain plastic until the adjacent strip is placed. Where monolithic curb construction is specified, the concrete shall be placed therein in proper sequence to be monolithic with the adjacent longitudinal strips of the slabs.

D. Placements on Continuous Steel Units

Unless otherwise indicated on the drawings, slabs on continuous steel units shall be placed in a single continuous operation without transverse construction joints using a mechanical longitudinal screed or a self-propelled transverse finishing machine. The initial set of the concrete shall be retarded sufficiently to ensure that concrete remains plastic in at least 3 spans immediately preceding the slab being placed. Construction joints shall be used, when required for slab placements on steel beams or girders, as shown on the drawings. When staged placement of a slab is specified in the drawings, it shall be necessary to ensure that the previously placed concrete attains a compressive strength of 3000 psi (20.7 MPa) before placing the next stage concrete. Multiple stages may be placed in a single day if approved by the Engineer or designated representative. When drawings permit staged concrete placement without specifying a particular order of placement, a placing sequence that will not overstress any of the supporting members shall be submitted for the approval of the Engineer or designated representative.

E. Slab and Girder Units

Unless indicated otherwise on the drawings, girders, slab and curbs of slab and girder spans shall be placed monolithically. Concrete girders shall be filled first, and the slab concrete placed within the time limits specified in this Item. If a transverse screed is used, the concrete shall be placed in the stem for a short distance and then the concrete placed in transverse strips. If a longitudinal screed is used, the concrete shall be placed in the outside girder stem first beginning at the low end or side, and then continue the concrete placed in longitudinal strips.

## 410S.17 Placing Concrete in Concrete Arches

Concrete shall be placed in arch rings so the loading is kept symmetrical on the falsework. The arch rings and ribs shall be placed in one continuous operation unless otherwise

indicated on the drawings or permitted by the Engineer or designated representative. The spandrel walls or columns and the beams shall not be placed until the arch is swung. Floor slab, railing, parapet walls, etc., shall not be placed until all spandrels are complete. Slab placement shall be symmetrical about the transverse centerline so the loading of the arch is kept approximately symmetrical.

The placing sequence shall be as indicated on the drawings.

### 410S.18 Placing Concrete in Box Culverts

In general, construction joints will be permitted only where indicated on the drawings.

Where the top slab and walls are placed monolithically in culverts more than 4 feet (1.22 meters) in clear height, an interval of not less than 1 nor more than 2 hours shall elapse before placing the top slab to allow for settlement and shrinkage in the concrete wall.

The base slab shall be trowel finished accurately at the proper time to provide a smooth uniform surface. Top slabs, which carry traffic, shall be finished as specified for roadway slabs in "Finish of Roadway Slabs", below. Top slabs of fill type culverts shall be given a reasonably smooth float finish.

### 410S.19 Placing Concrete in Foundations and Substructure

Concrete shall not be placed in footings until the depth and character of the foundation has been inspected by the Engineer or designated representative and permission has been given to proceed.

Placing of concrete footings upon seal courses will be permitted after the caissons or cofferdams are free from water and the seal course cleaned. Any necessary pumping or bailing during the concrete placement shall be done from a suitable sump located outside the forms.

All temporary wales or braces inside cofferdams or caissons shall be constructed or adjusted as the work proceeds to prevent unauthorized construction joints in footings or shafts.

When footings can be placed in a dry excavation without the use of cofferdams or caissons, forms may be omitted if desired by the Contractor and approved by the Engineer or designated representative and the entire excavation filled with concrete to the elevation of the top of footing.

Concrete in columns shall be placed monolithically unless otherwise indicated on the drawings. Columns and caps and/or tie beams supported thereon may be placed in the same operation or separately. To allow for settlement and shrinkage of the column concrete, it shall be placed o the lower level of the cap or tie beam and placement delayed for not less than 1 hour nor more than 2 before proceeding with the cap or tie beam placement.

### 410S.20 Treatment and Finishing of Horizontal Surfaces Except Bridge Slabs

All unformed upper surfaces shall be struck off to grade and finished. The use of mortar topping for surfaces under this classification will not be permitted.

After the concrete has been struck off, the surface shall be floated with a suitable float. Bridge sidewalks shall be given a wood float or broom finish or may be striped with a brush as specified by the Engineer or designated representative.

The tops of caps and piers between bearing areas shall be sloped slightly from the center toward the edge and the tops of abutments and transition bents sloped from the back wall to the edge, as directed by the Engineer or designated representative, so that water will drain from the surface. The concrete shall be given a smooth trowel finish. Bearing areas for steel units shall be constructed in such a manner to have a full and even bearing upon the concrete. When the concrete is placed below grade, bearing areas may be raised to grade on beds of Portland cement mortar consisting of 1 part cement, 2 parts sand and a minimum amount of water.

Bearing seat buildups or pedestals for concrete units shall be cast integrally with the cap or with a construction joint. The construction joint area under the bearing shall have the surface roughened thoroughly as soon as practical after initial set is obtained. The bearing seat buildups shall be placed using a latex based grout, an epoxy grout, or an approved proprietary bearing mortar, mixed in accordance with the manufacturer's recommendation. Pedestals shall be placed using Class C concrete, reinforced as indicated on the drawings.

The bearing area under the expansion end of concrete slabs and slab and girder spans shall be given a steel-trowel finish to the exact grades required on the drawings. Bearing areas under elastomeric bearing pads or nonreinforced bearing seat buildups shall be given a textured wood float finish. The bearing area shall not vary from a level plane more than 1/16 in. (1.6 mm) in all directions.

### 410S.21 Finish of Bridge Slabs

In all roadway slab-finishing operations, camber for specified vertical curvature and transverse slopes shall be provided.

For concrete flat slab and concrete slab and girder spans cast in place on falsework, an additional amount of camber shall be provided to offset the initial and final deflections of the span indicated in the drawings. For concrete slab and girder spans using pan forms, a camber of approximately 3/8 in. for 30 ft. (9.5 mm for 9.14 meter) spans and ½ in. for 40 ft. (12.7 mm for 12.19 meter) spans shall be provided to offset initial and final deflections unless otherwise directed by the Engineer or designated representative. When dead load deflection requirements for concrete flat slab and concrete slab and girder spans not using pan forms is not indicated on the drawings, the additional amount of camber shall be 1/8 inch per 10 foot (3.2 mm per 3 meter) of span length but not to exceed 1/2 inch (12.7 mm).

Bridge slabs supported on prestressed concrete beams, steel beams or girders shall receive no additional camber, except that for slabs without vertical curvature, the longitudinal camber shall be approximately 1/4 inch (6.35 mm).

Work bridges or other suitable facilities shall be provided from which to perform all finishing operations and to provide access, if necessary, for the Engineer or designated representative to check measurements for slab thickness and reinforcement cover.

As soon as the concrete has been placed and vibrated in a section of sufficient width to permit working, the surface shall be struck off, leveled and screeded, carrying a slight excess of concrete ahead of the screed to insure filling of all low spots. The screed shall be designed rigid enough to hold true to shape and shall have sufficient adjustments to provide for the required camber. A vibrating screed shall be used in all slabs more than 20 feet (6.1 meters) in width. A vibrating screed may be used if heavy enough to prevent undue distortion. The screeds shall be provided with a metal edge.

Longitudinal screeds shall be moved across the concrete with a saw like motion while their ends rest on headers or templates set true to the roadway grade or on the adjacent finished slab. The transverse screeds shall be moved longitudinally approximately 1/5 of the drum length for each complete out-and-back pass of the carriage.

The surface of the concrete shall be screeded a sufficient number of times and at such intervals to produce a uniform surface, true to grade and free of voids. If necessary, the screeded surface shall be worked to a smooth finish with a long handled wood or metal float of the proper size or hand floated from bridges over the slab. Floating may not be necessary if the pan float attached to a transverse screed produces an acceptable finish. Overworking the concrete surface and overuse of finish water shall be avoided.

The Contractor shall perform in the presence of the Engineer or designated representative sufficient checks with a long handled 16-foot (5 meter) straightedge on the plastic concrete to insure that the final surface will be within the specified tolerances. The check shall be made with the straightedge parallel to the centerline. Each pass thereof shall lap half of the preceding pass. All high spots shall be removed and all depressions over 1/16 inch (1.6 mm) in depth shall be filled with fresh concrete and floated. The checking and floating shall be continued until the surface is true to grade and free of depressions, high spots, voids or rough spots.

Screed-rail support holes shall be filled with concrete and finished to match the top of the slab.

The concrete surface shall be finished to a uniform texture using a carpet drag, burlap drag or broom finish. The surface shall be finished to a smooth sandy texture without blemishes, marks or scratches deeper than 1/16 inch (1.6 mm). The surface texturing shall be applied using a work bridge or platform immediately after completing the straightedge checks. The carpet or burlap drag shall be drug longitudinally along the concrete surface, adjusting the surface contact area or pressure to provide a satisfactory coarsely textured surface. A broom finish may be performed using a fine bristle broom transversely.

The concrete surface shall be coated immediately after the carpet or burlay drag, or broom finish with a single application of evaporation retardant at a rate recommended by the manufacturer. The time between the texturing at any location and subsequent application of evaporation retardant shall not exceed 10 minutes. The evaporation retardant may be applied using the same workbridge used for surface texturing. The concrete surface shall not be worked once the evaporation retardant has been applied.

Interim and final curing shall be applied in accordance with Section P410S.23, “Curing Concrete”.

The Contractor is responsible for the ride quality of the finished bridge slab. The Engineer or designated representative will use a 10-ft. (3.05 meter) straightedge to verify ride quality [1/8 in. or less in 10 ft (3.2 mm or less in 3.05 meters)] and to determine locations where

corrections are needed. If the Engineer or designated representative determines that the ride quality is unacceptable, then the Contractor shall submit to the Engineer or designated representative for approval a plan to produce a ride of acceptable quality. All corrections for ride-quality shall be made before saw-cutting grooves.

At the option of the Contractor or when indicated on the drawings, the hardened concrete surface of bridge slabs, bridge approach slabs and direct-traffic culverts shall be given its final texture by saw grooving to meet the above requirements after completion of the required curing period. Grooves shall be cut perpendicular to the structure centerline. The grooves shall be cut continuously across the slab to within 18 in. (450 mm) of the barrier rail, curb or median divider. At skewed metal expansion joints in bridge slabs, groove cutting shall be adjusted by using narrow-width cutting heads so that all grooves end within 6 in. (150 mm) of the joint, measured perpendicular to the centerline of the metal joint. There should not be any ungrooved surface wider than 6 in. (150 mm) adjacent to either side of the joint. The minimum distance to the first groove, measured perpendicular to the edge of the concrete joint or from the junction between the concrete and the metal leg of the joint shall be 1 in. (25 mm), Grooves shall be continuously cut across construction joints or other joints in the concrete that are less than ½ in. (13 mm) wide. The same procedure described above shall be used where barrier rails, curbs or median dividers are not parallel to the structure centerline in order to maintain the 18-in. (450-mm) maximum dimension from the end of the grooves to the gutter line. The grooves shall be cut continuously across formed concrete joints.

When the plans require that a concrete overlay be placed on the slab (new construction) or on prestressed concrete box beams or other precast elements, a carpet drag, burlap drag or broom finish shall be given to all concrete surfaces to be overlaid. Saw grooving is not necessary in this case. An average texture depth for the finish of approximately 0.035 in. (0.9 mm) shall be provided with no individual test falling below 0.020 in. (0.5 mm), unless otherwise indicated on the drawings, when tested in accordance with TxDoT's Tex-436-A, "Measurement of Texture Depth by the Sand Patch Method". If the texture depth falls below what is specified, the finishing procedure shall be revised to produce the desired texture.

When the drawings require an asphalt seal with or without overlay on the slab (new construction), on prestressed concrete box beams or on other precast elements, all concrete surfaces to be covered shall be given a lightly textured broom or carpet drag finish, similar to a sidewalk finish having an average texture depth of approximately 0.025 inch (0.635 mm), when tested in accordance with TxDoT's Tex-436-A, ".

### 410S.22 Placing Survey Monuments

The Contractor shall obtain City Survey Monuments, for a fee of 10 dollars, from the Department of Public Works, Construction Inspection Division. Monuments shall be embedded in freshly poured concrete at locations indicated on the drawings and accessible to survey equipment at the completion of the project. The monuments shall be installed flush with the adjacent concrete.

### 410S.23 Curing Concrete

The Contractor shall inform the Engineer or designated representative fully of the methods and procedures proposed for curing, shall provide the proper equipment and material in adequate amounts and shall have the proposed method, equipment and material approved by the Engineer or designated representative prior to placing concrete.

Inadequate curing and/or facilities therefore shall be cause for the Engineer or designated representative to notify the Contractor, in writing, that the work is unsatisfactory and the concrete will have to be removed and replaced.

All concrete shall be cured for a period of 4 curing days except as noted herein. A curing day is a calendar day when the temperature, taken in the shade away from artificial heat is above 50°F (10°C) for at least 19 hours or on colder days if the temperature of all surfaces of the concrete is maintained above 40°F (4°C) for the entire 24 hours. The required curing shall begin when all concrete has attained its initial set. TxDoT's Tex-440-A, "Initial Time-of-Set of Fresh Concrete" may be used to establish when the concrete has attained its initial set.

**Table 4: Exceptions to 4-Day Curing**

| Description | Type of Cement | Required Curing Days |
|---|---|---|
| Upper Surfaces of Bridge Slabs, Top Slabs of Direct Traffic Culverts and Concrete Overlays | I or II | 8 |
| | II or I/II | 10 |
| | All types with supplementary cementing materials | 10 |
| Concrete Piling buildups | | 6 |

For upper surfaces of bridge slabs, bridge support slabs, median and sidewalk slabs and culvert top slabs constructed using Class S Concrete (Standard Specification Item No. 403S, "Concrete for Structures") interim curing using a Type 1-D curing compound shall be applied as soon as possible after application of the evaporation retardant and after the water sheen has disappeared, but no more than 45 minutes after application of the evaporation retardant. Membrane interim curing shall be applied using a work bridge or other approved apparatus to ensure a uniform application. Final curing with water cure in accordance with this section shall start as soon as possible without damaging the surface finish. Water curing shall be maintained for the duration noted in the table above. Polyethylene sheeting, burlap-polyethylene blankets, laminated mats or insulating curing mats shall be placed in direct contact with the slab when the ambient temperature is expected to drop below 40°F (4°C) during the first 72 hours of the curing period. The curing materials will be weighed down with dry mats to maintain direct contact with the concrete and to provide insulation against cold weather. Supplemental heating or insulation may be required in cold and wet weather if the insulating cotton mats become wet or if the concrete temperature drops below the specified curing temperature. Application of heat directly to concrete surfaces shall be avoided.

For the top surface of any concrete unit upon which concrete is to be placed and bonded at a later date (i.e. stub walls, risers, etc.), only water-cure in accordance with this Section shall be used.

All other concrete shall be cured as specified in pertinent Items.

The following methods are permitted for curing concrete subject to the restrictions of this Item .

A. Form Curing

When forms are left in intimate contact with the concrete, other curing methods will not be required except for exposed surfaces and for cold weather protection.

When forms are striped before the 4-day minimum curing time has elapsed, curing shall continue by an approved method.

B. Water Curing

All exposed surfaces of the concrete shall be kept wet continuously for the required curing time. The water used for curing shall meet the requirements for concrete mixing water as indicated in Item No. 403S, "Concrete for Structures". Seawater will not be permitted. Water, which stains or leaves an unsightly residue, shall not be used.

1. Wet Mats

Wet cotton mats placed in direct contact with the slab shall be maintained for the required curing time. If needed damp burlap blankets made from 9-ounce (255 gm) stock may be placed on the damp concrete surface for temporary protection prior to the application of the cotton mats, which may be placed dry and wetted down after placement.

The mats shall be weighted down adequately to provide continuous contact with all concrete surfaces where possible. The surfaces of the concrete shall be kept wet for the required curing time. Surfaces, which cannot be cured by contact, shall be enclosed with mats, anchored positively to the forms or to the ground, so that outside air cannot enter the enclosure. Sufficient moisture shall be provided inside the enclosure to keep all surfaces of the concrete wet.

2. Water Spray

This method shall consist of overlapping sprays or sprinklers that keep all unformed surfaces continuously wet.

3. Ponding

This method requires the covering of the surfaces with a minimum of 2 inches (50 mm) of clean granular material, kept wet at all times or a minimum of 1 inch (25 mm) depth of water. Satisfactory provisions shall be made to provide a dam to retain the water or saturated granular material.

C. Membrane Curing

Unless otherwise indicated on the drawings, either Type 1-D or Type 2 membrane curing compound may be used where permitted except that Type 1-D (Resin Base Only) will be permitted for slab concrete in bridge decks and top slabs of direct traffic culverts and all other surfaces that require a higher grade of surface finish. For substructure concrete, only one Type of curing compound will be permitted on any one structure.

**TABLE 5**

| | REQUIRED | | PERMITTED | |
|---|---|---|---|---|
| **STRUCTURE UNIT DESCRIPTION** | **Water for Complete Curing** | **Membrane for Interim Curing** | **Water for Complete Curing** | **Membrane for Complete Curing** |
| 1. Upper surfaces of Bridge Roadway, Median and Side walk Slabs, Top Slabs of Direct Traffic, and Culverts. | X | X (resin base) | | |
| 2. Top Surface of any Concrete Unit upon which Concrete is to be placed and bonded at a later interval (Stub Walls, Risers, etc.). Other Super-structure Concrete (curbs, wing-walls, Parapet Walls, etc.). | X | | *X | *X |
| 3. Top Surface of Precast and/or Pre-stressed Piling. | X | X | | |
| 4. All Substructure Concrete Culverts. Box Sewers, Inlets, Manholes, Retaining Walls, Riprap. | | | *X | *X |

* Polyethylene Sheeting, Burlap-Polyethylene Mats or Laminated Mats in close intimate contact with the concrete surfaces, will be considered equivalent to water or membrane curing for items under 4.

The membrane curing shall be applied just after free moisture has disappeared in a single, uniform coating at the rate of coverage recommended by the manufacturer and as approved by the Engineer or designated representative, but not less than 1 gallon per 180 square feet (1 liter per 4.4 square meters) of area. Tests for acceptance shall be at this specified rate.

Membrane curing shall not be applied to dry surfaces, but shall be applied just after free moisture has disappeared. Formed surfaces and surfaces which have given a first rub shall be dampened and shall be moist at the time of application of the membrane.

When membrane is used for complete curing, the film shall remain unbroken for the minimum curing period specified. Membrane, which is damaged, shall be corrected immediately by reapplication of membrane. Polyethylene sheeting, burlap-polyethylene mats or laminated mats in close intimate contact with the concrete surfaces, will be considered equivalent to membrane curing. Unless otherwise indicated on the drawing, the choice of membrane type shall be at the option of the Contractor, except that the Engineer or designated representative may require the same curing method for like portions of a single structure.

### 410S.24 Removal of Forms and Falsework

Unless otherwise indicated on the drawing, forms for vertical surfaces may be removed when the concrete has aged 12 hours after initial set, provided it can be done without damage to the concrete. Forms for mass concrete placements shall be maintained in place for 4-days following concrete placement. Mass placements are defined as concrete placements with a least dimension greater than equal to 5 ft. (1.575 meters), or those designated as such on the drawings.

Forms for inside curb faces may be removed in approximately 3 hours provided it can be done without damage to the curb.

Unless indicated otherwise on the drawings weight supporting forms and falsework spanning more than 1 ft. (300 mm) for structures, bridge components and culvert slabs shall remain in place until the concrete has attained a minimum compressive strength of 2500 psi (17.25 MPa). Forms for other structural components may be removed as specified by the Engineer or designated representative.

Inside forms (walls and top slabs) for inlets, box culverts and sewers may be removed after the concrete has attained a minimum compressive strength of 1800 psi (12.4 MPa), provided an overhead support system, approved by the Engineer or designated representative, is used to transfer the weight (mass) of the top slab to the walls of the box culvert or sewer before the support provided by the forms is removed.

If all test cylinders made for the purpose of form removal have been broken without attaining the required strength, forms shall remain in place for a total of 14 curing days.

The above provisions relative to form removal shall apply only to forms or parts thereof which are constructed to permit removal without disturbing forms or falsework required to be left in place for a longer period on other portions of the structure.

Remove all metal appliances used inside forms for alignment shall be removed to a depth of at least ½ in. (13 mm) from the concrete surface. The appliances shall be manufactured to allow the removal without undue chipping or spalling of the concrete, and so that it leaves a smooth opening in the concrete surface when removed. Rods, bolts and ties shall not be burned-off.

Backfilling against walls of Type I or Type II cement shall not take place for a minimum of 7 days. Backfilling against walls of Type III cement shall not take place until the cylinder compressive strength has reached 3000 psi (20.7 MPa) or the wall has cured for 5 days.

All forms and falsework shall be removed unless indicated otherwise on the drawings.

### 410S.25 Defective Work

Any defective work discovered after the forms have been removed shall be repaired as soon as possible in accordance with "Finishing Exposed Surfaces", below.

If the surface of the concrete is bulged, uneven or shows excess honeycombing or form marks, which in the opinion of the Engineer or designated representative, cannot be repaired satisfactorily, the entire section shall be removed and replaced at the expense of the Contractor.

### 410S.26 Finishing Exposed Surfaces

A. Ordinary Surface Finish

An Ordinary Surface Finish shall be applied to all concrete surfaces either as a final finish or preparatory to a higher grade or class of finish. Higher grades and classes of finish shall conform to Item No. 411S, "Surface Finishes for Concrete". Where neither a grade or class of finish is specified, an Ordinary Surface Finish only, will be required.

Ordinary Surface Finish shall be provided as follows:

1. After formal removal, all porous, honeycombed areas and spalled areas shall be corrected by chipping away all loose or broken material to sound concrete.
2. Featheredges shall be eliminated by saw-cutting and chipping spalled areas to a depth at least ½ in. (13 mm) deep perpendicular to the surface. Shallow cavities shall be repaired using a latex adhesive grout, cement mortar or epoxy grout approved by the Engineer or designated representative. If judged repairable by the Engineer or designated representative, large defective areas shall be corrected using concrete or other material approved by the Engineer or designated representative.
3. Holes and spalls caused by removal of form ties, etc., shall be cleaned and filled with latex adhesive grout, cement mortar or epoxy grout approved by the Engineer or designated representative. Only the holes shall be filled. The patch shall not be blended with the surrounding concrete. On surfaces to receive a rub finish in accordance with Standard Specification Item No. 411S, “Surface Finishes for Concrete” the exposed parts of metal chairs shall be chipped out to a depth of 1/2 inch (13 mm) and the surface repaired.
4. All fins, runs, drips or mortar that will be exposed shall be removed from surfaces. Form marks and chamfer edges shall be smoothed by grinding and/or dry rubbing.
5. Grease, oil, dirt, curing compound, etc., shall be removed from surfaces requiring a higher grade of finish. Discolorations resulting from spillage or splashing of asphalt, paint or other similar material shall be removed.
6. Repairs shall be dense, well bonded and properly cured and when made on surfaces, which remain exposed and do not require a higher finish, shall be finished to blend with the surrounding concrete.

Unless otherwise indicated on the drawings Ordinary Surface Finish shall be the final finish for the following exposed surfaces:

1. inside and top of inlets,
2. inside and top of manholes,
3. inside of sewer appurtenances,
4. inside of culvert barrels,
5. bottom of bridge decks between beams or girders,
6. vertical and bottom surfaces of interior concrete beams or girders.

B. Rubbed Finish

In general, the following areas shall require a rubbed finish and shall receive a first and second rubbing:

1. The top, exterior and roadway facia of curbs and parapet walls.
2. All concrete surfaces of railing.
3. The exterior vertical facia of slab spans, rigid frames, arches and box girders.
4. The outside and bottom surfaces of facia beams or girders (except precast concrete beams).

5. The underside of overhanging slabs to the point of juncture of the supporting beams.
6. All vertical surfaces of piers, columns, bent caps, abutments, wing walls and retaining walls which are exposed to view after all backfill and embankments is placed.
7. Exposed formed surfaces of inlet and outlet structures on culverts, transition structures, headwalls and inlets.
8. Such other surfaces specified elsewhere to receive a rubbed finish and such additional surfaces required by the Engineer or designated representative to receive a rubbed finish.

After removal of forms and as soon as the mortar used in pointing has set sufficiently, surfaces to be rubbed shall be wet with a brush and given a first surface rubbing with a medium coarse carborundum stone. This rubbing shall be done before the concrete has cured more than 48 hours.

The second rubbing shall present a cleaned uniform appearance free from drip marks and discoloration. It shall be given with a No.30 carborundum stone or an abrasive of equal quality.

If the Contractor elects to use epoxy paint in lieu of the second rubbings the Contractor may do so upon approval of the Engineer or designated representative.

C. Special Surface Finishes

Striated, exposed aggregate and other special surface finishes shall conform to Standard Specification Item No. 411S, "Surface Finishes for Concrete" and/or with the requirements indicated on the drawings.

## 410S.27 Measurement and Payment

No direct measurement or payment will be made for the work to be done or the equipment to be furnished under this item, but shall be included in the unit price bid for the item of construction in which this item is used.

**End**

| **SPECIFIC** CROSS REFERENCE MATERIALS |
|---|
| Standard Specification Item 410S, “Concrete Structures” |

City of Austin Standard Specification Items

| Designation | Description |
|---|---|
| Item No. 360S | Concrete Pavement |
| Item No. 401S | Structural Excavation and Backfill |
| Item No. 403S | Concrete for Structures |
| Item No. 406S | Reinforcing Steel |
| Item No. 411S | Surface Finishes for Concrete |
| Item No. 413S | Cleaning and/or Sealing Joints and Cracks (PC Concrete) |
| Item No. 425S | Prestressed Concrete Structures |

U.S. Department of Commerce Voluntary Product Standard, PS 1

American Concrete Institute

| Designation | Description |
|---|---|
| ACI 347 | Guide to Formwork for Concrete |

American Society for Testing and Materials (ASTM)

| Designation | Description |
|---|---|
| ASTM D-994 | Preformed Expansion Joint Filler for Concrete (bituminous Type) |
| ASTM D-1751 | Prefprmed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) |
| ASTM D-1752 | Prefprmed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction |

Texas Department of Transportation: Departmental Material Specifications

| Designation | Description |
|---|---|
| DMS-4640 | Chemical Admixtures for Concrete |
| DMS-4650 | Hydraulic Cement Concrete Curing Materials and Evaporation Retardants" |
| DMS-6100 | Epoxy and Adhesives |
| DMS-6160 | Waterstops, Nylon Reinforced Neoprene Sheet, and Elastomeric Pads |
| DMS-6310 | Joint Materials and Fillers |

Texas Department of Transportation: Manual of Testing Procedures

| Designation | Description |
|---|---|
| Tex-436-A | Measurement of Texture Depth by the Sand Patch Method |
| Tex-440-A | Initial Time-of-Set of Fresh Concrete |

| **RELATED** CROSS REFERENCE MATERIALS |
|---|
| Standard Specification Item 410S, "Concrete Structures" |

American Society for Testing and Materials, ASTM

| Designation | Description |
|---|---|
| A 36/A 36M | Carbon Structural Steel |
| A 82 | Steel Wire, Plain, for Concrete Reinforcement |
| A 185 | Steel Welded Wire Fabric, Plain, for Concrete Reinforcement |
| A 496 | Steel Wire, Deformed, for Concrete Reinforcement |
| A 497 | Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement |
| A 615/A 615M | Deformed and Plain Billet-steel Bars for Concrete Reinforcement |
| A 675/A 675M | Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties |
| A 706/A 706M | Low- Alloy Steel Deformed and Plain Bars for Concrete Reinforcement |
| A 775/A 775M | Epoxy-Coated Reinforcing Steel Bars |
| A 884/A 884M | Epoxy-Coated Steel Wire and Welded Wire Fabric For Reinforcement |
| A 934/A 934M | Epoxy-Coated Prefabricated Reinforcing Steel Bars |
| A 996/A 996M | Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement |
| D3963/D3963M | Fabrication and Jobsite Handling of Epoxy-coated Reinforcing Steel Bars |

Texas Department of Transportation: Manual of Testing Procedures

| Designation | Description |
|---|---|
| Tex-739-I | Sampling and Testing Epoxy Coated Reinforcing Steel |

City of Austin Standard (Details)

| Designation | Description |
|---|---|
| Standard 406S-1 | Reinforced Steel Tolerances |

Texas Department of Transportation: Departmental Material Specifications

| Designation | Description |
|---|---|
| DMS 8130 | Epoxy Powder Coating for Reinforcing Steel |

City of Austin Standard Specification Items

| Designation | Description |
|---|---|
| Item No. 404S | Pneumatically Placed Concrete |
| Item No. 407S | Fibrous Concrete |
| Item No. 414S | Concrete Retaining Walls |
| Item No. 420S | Drilled Shaft Foundations |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item No. 360 | Concrete Pavement |
| Item No. 420 | Concrete Structures |
| Item No. 421 | Hydraulic Cement Concrete |
| Item No. 422 | Reinforced Concrete Slab |
| Item No. 423 | Retaining Walls |
| Item No. 440 | Reinforcing Steels |

## 509S.1 Description

This item shall govern the designing, furnishing, installing, maintaining and removing or abandoning of temporary Excavation Safety Systems consisting of trench shields, aluminum hydraulic shoring, timber shoring, trench jacks, tieback or braced sheeting, tieback slurry walls, soil nailing, rock bolting, tieback or braced soldier piles and lagging, and other systems for protecting workers in excavations. This item shall also govern the designing and constructing of sloping and benching systems for protecting workers in excavations.

At a minimum, the Excavation Safety Systems shall conform to United States Department of Labor Rules 29 CFR, Occupational Safety and Health Administration, Part 1926 Safety and Health Regulations for Construction, Subpart P, Excavation (hereinafter called OSHA).

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.

## 509S.2 Definitions

"Competent Person" shall mean one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. The competent person shall be capable of interpreting the manufacturer's data sheets and interpreting and implementing the Excavation Safety System Plan.

An "Excavation" shall mean any cut, cavity, trench, or depression in an earth surface, formed by earth removed by the Contractor. The Contractor shall provide an Excavation Safety System for all excavations except when 1) the excavation is in stable rock as determined by the Texas-licensed Professional Engineer who prepared the Contractor's Excavation Safety System Plan or 2) the excavation is less than 5 feet (1.52 m) in depth and examination of the ground by the Contractor's competent person provides no indication of a potential cave-in.

"Trench" (trench excavation) shall mean any narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth shall be greater than the width, but the width of a trench (measured at the bottom) shall not be greater than 15 feet (4.56 m). Excavation Safety Systems for such trenches shall be defined as "Trench Excavation Safety Protective Systems".

If the Contractor installs or constructs forms or other structures in an excavation such that the dimension measured from the forms or structures to the sides of the excavation is reduced to 15 feet (4.6 m) or less (measured at the bottom of the excavation), those excavations shall also be defined as a Trench if workers must enter it. Excavation Safety Systems for such trenches shall also be defined as "Trench Excavation Safety Protective Systems".

## 509S.3 Excavation Safety System Submittals

A. The Notice to Proceed with construction may be issued by the Owner before the Contractor has submitted the necessary Excavation Safety Plan(s); however, excavation shall not proceed until the Owner has received the Contractor's Excavation Safety Plan(s) for the Project.

B. Prior to Starting Excavation

Prior to starting any Excavation, the Contractor shall submit to the Owner:

1. A certificate indicating that the Contractor's Competent Person(s) has completed training in an excavation safety program based on OSHA regulations within the past 5 years.
2. Manufacturer's tabulated data or other tabulated data for Excavation Safety Systems consisting of pre-engineered protective systems such as trench shields, aluminum hydraulic shoring, timber shoring, pneumatic shoring, or trench jacks, or benching or sloping or other protective systems that are not designed specifically for the Project.

   Manufacturer's tabulated data shall meet the requirements in OSHA and shall describe the specific equipment to be used on the Project. Tabulated data must bear the seal of the licensed professional engineer who approved the data. Manufacturer's tabulated data shall be an attachment to the Contractor's Excavation Safety System Plan described below.

## 509S.4 Excavation Safety System Plan

The Contractor shall prepare an Excavation Safety System Plan (hereafter called the "Plan") specifically for the Project. The Contractor shall retain a Texas-licensed Professional Engineer to prepare the Plan. On City-funded projects, the Contractor must follow qualifications-based procedures to procure the required Professional Engineering services, according to Chapter 2254 of the Texas Government Code.

The Contractor shall be responsible for obtaining geotechnical information necessary for design of the Excavation Safety System. If geotechnical information for design of the Project has been acquired by the Owner or designated representative, it shall be provided to the Contractor for information purposes subject to the provisions of City of Austin Standard Contract Section 00220, "Geotechnical Data."

A. The Plan for Excavation Safety Systems consisting of pre-engineered protective systems such as trench shields, aluminum hydraulic shoring, timber shoring, pneumatic shoring, or trench jacks, or benching or sloping or other protective systems that are not designed specifically for the Project shall include:

   1. Detailed Drawings of the Excavation Safety System(s) that will provide worker protection conforming to OSHA. The Drawings shall note the required load carrying capacity, dimensions, materials, and other physical properties or characteristics in sufficient detail to describe thoroughly and completely the Excavation Safety System(s).
   2. Drawings, notes, or tables clearly detailing the specific areas of the Project in which each Excavation Safety System shall be used, the permissible size of the excavation, the length of time that the excavation shall remain open, the means of egress from the excavation, the location of material storage sites in relation to the excavation, the methods for placing/compacting bedding/backfill within the safety of the system, any excavation safety equipment restrictions and subsequent removal of the system.
   3. Recommendations and limitations for using the Excavation Safety Systems.
   4. A Certificate of Insurance of the Excavation Safety System Engineer's Professional Liability Insurance coverage. For City-funded projects, coverage meeting the requirements of Standard Contact Documents Section 00810 shall be provided. For privately funded projects the coverage shall be at least $1,000,000.

B. The Plan for Excavation Safety Systems consisting of tieback or braced sheeting, tieback or braced soldier piles and lagging, slurry walls, soil nailing, rock bolting or other protective systems that are designed specifically for the Project shall include:

1. Detailed Drawings of the Excavation Safety System(s) that will provide worker protection conforming to OSHA. The Drawings shall note the design assumptions, design criteria, factors of safety, applicable codes, dimensions, components, types of materials, and other physical properties or characteristics in sufficient detail to describe thoroughly and completely the Excavation Safety System(s).
2. Detailed technical specifications for the Excavation Safety System addressing the properties of the materials, construction means and methods, quality control and quality assurance testing, performance monitoring, and monitoring of adjacent features, as appropriate.
3. Drawings that clearly detail the specific areas of the Project in which each type of system shall be used and showing the plan and elevation (vertical profile) views.
4. Drawings, notes or tables clearly detailing the length of time that the excavation shall remain open, the means of egress from the excavation, the location of material storage sites in relation to the excavation, the methods for placing/compacting bedding/backfill within the safety of the system, any excavation safety equipment restrictions and subsequent removal or abandonment of the system or parts thereof.
5. Recommendations and limitations for using the Excavation Safety Systems.
6. A Certificate of Insurance of the Excavation Safety System Engineer's Professional Liability Insurance coverage. For City-funded projects, coverage meeting the requirements of Standard Contract Documents Section 00810 shall be provided. For privately funded projects the coverage shall be at least $1,000,000.

### 509S.5 Excavation Safety System Submittal Review

Review of the Excavation Safety System submittal conducted by the Owner or designated representative shall only relate to conformance with the requirements herein. The Owner's failure to note exceptions to the submittal shall not relieve the Contractor of any or all responsibility or liability for the adequacy of the Excavation Safety System. The Contractor shall remain solely and completely responsible for all Excavation Safety Systems and for the associated means, methods, procedures, and materials.

### 509S.6 Contractor’s Responsibility

The Contractor shall be responsible for implementing the Excavation Safety System Plan and for confirming that the Excavation Safety System(s) used on the Project meets the requirements of the Plan.

The Contractor’s Competent Person(s) shall be on the Project whenever workers are in an excavation meeting the definitions of a Trench given in 509S.2.

### 509S.7 Construction Methods

The Contractor's Competent Person(s) shall maintain a copy of appropriate OSHA regulations onsite and shall implement OSHA excavation safety regulations at the work site. The Contractor shall perform all excavation in a safe manner and shall maintain the Excavation Safety Systems to prevent death or injury to personnel or damage to structures, utilities or property in or near excavation.

If evidence of possible cave-ins or earthen slides is apparent or an installed Excavation Safety System is damaged, the Contractor shall immediately cease work in the excavation, evacuate

personnel from any potentially hazardous areas and notify the Owner. Personnel shall not be allowed to re-enter the excavation until necessary repairs or replacements are completed and are inspected and approved by the Contractor's Competent Person(s). Repair and replacement of damaged Excavation Safety System shall be at the Contractor's sole expense.

### 509S.8 Changed Conditions

When changed conditions require modifications to the Excavation Safety System, the Contractor shall provide to the Owner or designated representative a new design or an alternate Excavation Safety System Plan that is proposed by the Contractor's Excavation Safety System Engineer to address the changed conditions. Copies of the new design or alternate system shall be provided to the Owner or designated representative in accordance with the requirements of section 509S.3, "Excavation Safety System Plan Submittals". A copy of the most current Excavation Safety System Plan shall be maintained on site and made available to inspection and enforcement officials at all times.

Any changes to the Excavation Safety System Plan that are initiated by the Contractor for operational efficiency or as a result of changed conditions, that could be reasonably anticipated, will not be cause for contract time extension or cost adjustment. When changes to the Excavation Safety System Plan are necessitated by severe and uncharacteristic natural conditions or other conditions not reasonably within the control of the Contractor, the Contractor may make a written request to the Owner for a Change Order to address the anticipated work. The Contractor shall notify the Owner in writing within 24 hours of the occurrence of changed conditions that the Contractor anticipates the submittal of a claim for additional compensation. Under 'Changed Conditions" the work deemed immediately necessary by the Contractor to protect the safety of workers and public, equipment or materials may only be accomplished until the Owner or designated representative has a reasonable opportunity to investigate the Contractor's written request for a Change Order and respond in writing to the request.

### 509S.9 Measurement

Trench Excavation Safety Protective Systems will only be measured and paid for those trenches that workers would reasonably be expected to enter.

Trench Excavation Safety Protective Systems for Trenches excavated to a final width (measured at the bottom of the excavation) not exceeding 15 feet (4.56 m) shall be measured by the linear foot (meter: 1 meter equals 3.281 feet) through manholes, bore pits, receiving pits, and other appurtenances along the centerline of the trench. This method of measurement shall apply to any and all protective systems, including but not limited to tieback or braced sheeting, tieback or braced soldier piles and lagging, slurry walls, soil nails, rock bolts, shoring, trench boxes, and sloping or benching as used to provide a Trench Excavation Safety Protective System in accordance with the Excavation Safety System Plan.

Trench Excavation Safety Protective Systems for Trenches created by installation or construction of forms or other structures in an excavation whose width is greater than 15 feet (4.56 m) such that the dimension measured from the forms or structures to the sides of the excavation is reduced to 15 feet (4.56 m) or less (measured at the bottom of the excavation) shall be measured by the linear foot along the centerline of the Trench. Where forms or structures create multiple Trenches in one excavation, each Trench shall be measured separately. This method of measurement shall apply to any and all protective systems, including but not limited to tieback or braced sheeting, tieback or braced soldier piles and lagging, slurry walls, soil nails, rock bolts, shoring, trench boxes, and sloping or benching as used to provide a Trench Excavation Safety Protective System in accordance with the Excavation Safety System Plan.

**509S.10 Payment**

Payment for Trench Excavation Safety Protective Systems, measured as prescribed above, will be made at unit bid price per centerline linear foot of Trench. The unit bid price shall include full compensation for designing, furnishing, installing the system; for dewatering, and for maintaining, replacing, repairing and removing the Trench Excavation Safety Protective System and for sloping, special clearing, and excavation necessary to safely implement the Excavation Safety System Plan. No payment will be made for Trench Excavation Safety Protective Systems made necessary by the Contractor's selection of an optional design or sequence of work that creates the need for the Trench Excavation Safety Protective System.

Payment will be made under the following:

**Pay Item No. 509S-1**: Trench Excavation Safety Protective Systems, (all depths) Per Linear Foot.

**END**

| ***SPECIFIC*** Cross Reference Materials |
|---|
| Standard Specification Item No. 509S, "Excavation Safety Systems" |

City of Austin Standard Contract Documents

| Designation | Description |
|---|---|
| Section 00020 | Invitation for Bids |
| Section 00220 | Geotechnical Data |
| Section 00650 | Certificate of Insurance |
| Section 00700, Article 6.11 | Safety and Protection |
| Section 810 | Supplemental General Conditions |

29 CFR, Occupational Safety and Health Administration, Part 1926 Safety and Health Regulations for Construction, Subpart P, Excavation
Texas Health and Safety Code Title 9 Chapter 756 Subchapter C
Texas Government Code Chapter 2254

| ***RELATED*** Cross Reference Materials |
|---|
| Standard Specification Item No. 509S, "Excavation Safety Systems" |

Texas Department of Transportation Standard Specifications
For Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item 104 | Removing Concrete |
| Item 110 | Excavation |
| Item 402 | Trench Excavation Protection |

City of Austin Standard Specification Items

| Designation | Description |
|---|---|
| Item No. 101S | Preparing Right of Way |
| Item No. 102S | Clearing and Grubbing |
| Item No. 110S | Street Excavation |
| Item No. 111S | Excavation |
| Item No. 130S | Borrow |

| | |
|---|---|
| Item No. 132S | Embankment |
| Item No. 201S | Subgrade Preparation |
| Item No. 402S | Controlled Low Strength Material |
| Item No. 501S | Jacking or Boring Pipe |
| Item No. 503S | Frames, Grates, Rings and Covers |
| Item No. 504S | Adjusting Structures |
| Item No. 505S | Concrete Encasement and Encasement Pipe |
| Item No. 506 | Manholes |
| Item No. 507S | Bulkheads |
| Item No. 510 | Pipe |
| Item No. 511S | Water Valves |
| Item No. 593S | Concrete Retards |
| Item No. 594S | Gabions and Revet Mattresses |

**Item No. 510**
**Pipe**

## 510.1 Description

This item governs the furnishing and installing of 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 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 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 and equipment the Contractor proposes for incorporation into the Work are of the kind and quality that satisfies the specified functions and quality. Austin Water Utility Standard Products Lists (SPL) form a part of the Specifications. Contractors may, when appropriate, elect to use products from the SPL; however, submittal to the E/A is still required. Should the Contractor elect to use any materials from these lists, each product shall be completely and clearly identified by its corresponding SPL number when making the product submittal. This will expedite the review process in which the E/A, and, if necessary, the Austin Water Utility Standard Products Committee, decides whether the products meet the Contract requirements and the specific use foreseen by the E/A in the design of this engineered Project. The purpose of the SPL's is to expedite review, by the E/A and, if necessary, the Austin Water Utility Standard Products Committee, of Contractor product submittals. The SPL's shall not be considered as being a pre-approved list of products necessarily meeting the requirements of the Project. Items contained in the SPL cannot be substituted for items shown on the Drawings, or called for in the specifications, or specified in the Bidding Requirements, Contract Forms and Conditions of Contract, unless approved by the E/A in conjunction with the Austin Water Utility Standard Products Committee. The Standard Product List current at the time of plan approval will govern.

(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 |
|---|---|
| 1-1/2" | 0 |
| 1" | 0-10 |
| 1/2" | 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 |
| 1/4" | 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 |
|---|---|
| 3/8" | 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 |
|---|---|
| 3/4" | 0 |
| 1/2" | 0-25 |
| 1/4" | 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 Austin Water Utility's Standard Products List 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 (3/4 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 Standard Products List (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 City of Austin 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 the Austin Water Utility will be required. Additionally, such fabricator shall furnish certification that each fabricated joint has been satisfactorily tested hydrostatically at a minimum pressure of 300 psi.

-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 Austin Water Utility's Standard Products List 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 map).

-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 1/8 inch minimum thickness of natural or synthetic rubber, cloth-reinforced rubber or neoprene material, preferably 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 2 inches 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 Texas Department of Transportation (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 1/2 inch for 16-inch pipe and 3/4 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 Tubing

1. General

All polyethylene (PE) tubing shall be high density, high molecular weight plastic tubing meeting ASTM D 2737; it shall be pressure rated at 200 psi working pressure and must bear the National Sanitation Foundation seal of approval for potable water service. Pipe manufacturers shall be listed on SPL WW-65.

2. Materials

Polyethylene plastics shall be Designation PE3408 (Grade P34 with hydrostatic design stress of 800 psi).

3. Markings

Permanent marking on the tubing shall include the following at intervals of not more than 5 feet:

Nominal tubing size.

Type of plastic material, i.e., PE 3408.

Dimension Ratio (DR) and pressure rating in psi for water at 73.4 F (e.g., SDR-9, 200 psi).

ASTM D 2737 designation.

Manufacturer's name or trademark, code and seal of approval (NSF mark) of the National Sanitation Foundation.

Polyethylene tubing for reclaimed service lines shall be purple.

4. Tube Size

PE tubing shall be standard copper tube size outside diameter, with Standard Dimension Ratio (SDR) of 9.

(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 Water and Wastewater Standard Products List (SPL WW-68), or called for in the City of Austin Standard Details (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 City of Austin Standards, Austin Water Utility Standard Products Lists, 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 3/4” 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 thrust blocking shall be placed behind bends and tees. 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.

2. Applicable Specifications

Except as modified or supplemented herein, PVC pipe shall meet the following standards:

AWWA C-900, 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 12454B 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 12454B).

Standard Dimension Ratio and the pressure rating in psi for water at 73 F (e.g., SDR 14, 200 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.

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 D 3034"

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 1/2 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, 1/8 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 1/2 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:

10 1/2 inches wide for 2 2/3 inches x 1/2-inch corrugations.

12 inches wide for 3 inches x 1 inch or 5 inches x 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.

16 1/4 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 1/2-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 1/8 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 1/8 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 1/2 inch ± annular space between pipe ends when joined together.

Bands shall be drawn together by two 1/2 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, a street cut 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 insure 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 1/4 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 existing streets, roads or other traffic areas shall be laid with at least 66 inches of cover.

3. Wastewater piping installed in such proposed streets shall be laid with at least 48 inches of cover below the actual subgrade.

(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 insure 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 batter boards or electronic devices for controlling the Work shall be furnished by, and at the expense of, the Contractor. Batter boards shall be of adequate size material and shall be supported substantially. The boards and all location stakes must be protected from possible damage or change of location. The Contractor shall furnish good, sound twilled lines for use in achieving lines and grades and the necessary plummets and graduated poles.

The Contractor shall submit to the Engineer at least six copies of a detailed pipe laying schedule for review and approval. The laying schedule shall list all types of pipe, fittings, valves, hydrants, flanged outlets, and other appurtenances required for construction. The Contractor shall submit the laying schedule at least 30 days in advance of construction on the project. The Engineer will forward review comments to the Contractor for revisions. The Contractor shall make revisions and forward to

the Engineer for review. Prior to start of construction on the Project, the Engineer will send a reviewed final laying schedule marked for construction to the Contractor. 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 storm water pipe and at least 12 inches (300 mm) above water, reclaimed, and wastewater pipe.

Standard Bedding Materials

| USE / PIPE MATERIAL | Cement Stabilized Backfill | Natural or Mf'd Sand | Pea Gravel | PIPE BEDDING STONE | | | |
|---|---|---|---|---|---|---|---|
| | | | | Uncrushed Gravel | Crushed Gravel | Crushed Stone | Stone Screenings |
| WATER and RECLAIMED WATER | | | | | | | |
| Welded Steel | X | | | | | X | |
| Service Tubing 3/4" to 2-1/2" | | 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. 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 is 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 insure a uniform volume of rubber around the circumference of the groove. The spigot shall be centered in the bell, the pipe pushed home uniformly and brought into true alignment. 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.

(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 1/8" into the interior of the pipe will not be accepted. Excess joint material will be removed to within 1/8''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 22-1/2 degrees; other bends as directed shall be securely anchored by suitable concrete thrust blocking or by approved metal harness. Unless otherwise indicated, on 24 inch or larger piping, all bends greater than 11 1/4 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 City of Austin Standard No. 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 4 1/2 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.

(a) Shutoffs

The City will make all shutoffs on existing potable or reclaimed water mains. The Contractor shall be required to notify the E/A's field representative on the job at least 72 hours prior to the desired time for any shutoff. The E/A's field representative will notify any affected utility customers at least 48 hours prior to the shutoff. The Water Utility 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 the Water Utility. The operation of the valve is to be conducted under the immediate supervision of the E/A's field 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 Water Potable or Reclaimed System

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 Austin Water Utility Inspector must be present. "Size on size" taps will not be permitted, unless made by use of an approved full circle gasket tapping sleeve. Concrete blocking shall be placed behind and under all tap sleeves 24 hours prior to making the wet tap.

(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 3/4 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 E/A may approve any of the following well graded materials:

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 E/A 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 required density using any method, type and size of equipment, which will give the required compaction without damaging the pipe or bedding. Placement of backfill greater than 2 feet beyond structures in Right of Way shall be conform to (g) below. The depth of layers, 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 layer shall be brought to the moisture content necessary to obtain the required density and shall be kept level to insure uniform compaction over the entire layer. Testing for density shall be in accordance with Test Method Tex-114-E and Test Method Tex-115-E.

Each layer of backfill must provide the density as required herein. Swelling soils (soils with plasticity index of 20 or more) 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 (soils with plasticity index less than 20) shall be sprinkled as required 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 layer of backfill is complete, tests may be made by the E/A. 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 E/A may order proof rolling to test the uniformity of compaction of the backfill layers. All irregularities, depressions, weak or soft spots that develop shall be corrected immediately by the Contractor.

Should the backfill, due to any reason, lose the required 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 indicated. The remainder of the street backfill shall be Flexible Base, Concrete or Hot Mix Asphalt Concrete as indicated or to replaced in kind to the surface removed to construct 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 element 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 (1-5/8" dia.) submerged at any point along the line.

(e) Low Pressure Air Test of Gravity Flow Wastewater Lines

1. General

Wastewater lines up to 24-inch diameter shall be air tested between manholes. Wastewater lines 30-inch in diameter shall be air tested between manholes or at pipe joints. Wastewater lines 36-inch diameter and larger shall be air tested at 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 backpressure of any ground water 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 backpressure 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 Austin Water Utility maintenance personnel.

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.

Lines that are 36 inches or larger inside diameter must be air tested at each joint. Lines that are 30-inch diameter may be air tested at each joint. 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 CDs/DVDs 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 CD/DVD, 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. Compact Disc (CD) or Digital Video Disc (DVD) of recording of storm drain conduits (concrete storm water pipe or box culvert).
   a. The color CD or DVD 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 City of Austin 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 City of Austin 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 and the hydrant valve seats closed and 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:

$$\text{Allowable leakage (gal / hr)} = [L \times D] \div 10{,}875$$

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.

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 $265.00, plus $50.00 for each hour over four hours. 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

(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

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 City of Austin. 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. Backflow prevention in the form of a reduced pressure backflow assembly must 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 50 mg/liter available chlorine.

The disinfecting solution shall be retained in the piping for at least 24 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 25 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 “Standard Methods”. 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 until the chlorine concentration is no higher than the residual generally prevailing in the existing distribution system. Proper planning and appropriate preparations in handling, diluting, if necessary, and disposing of this strong chlorine solution is necessary to insure 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. 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 the Austin Water Utility. 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 Austin Water Utility Dispatch office.

(e) Bacteriological Testing

After final flushing of the strong disinfecting solution, two (2) sets of water samples from the line, that are taken at least twenty-four (24) hours apart, 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 and additional samples that are collected at intervals of not more than 1000 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 "Standards Methods." 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 City of Austin Water Quality Laboratory will notify the assigned City of Austin 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.

## 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.

**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-E or 510-F.

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:

clearing

constructing any necessary embankment

excavation

disposal of surplus or unusable excavated material

furnishing, hauling and placing pipe

field constructed joints, collars, temporary plugs, caps or bulkheads

all necessary lugs, rods or braces

pipe coatings and protection

connections to existing systems or structures, concrete blocking and thrust blocks and restrained joints

preparing, shaping, pumping for dewatering, and shoring of trenches

bedding materials

backfill materials

hauling, placing and preparing bedding materials

particle migration measures

hauling, moving, placing and compacting backfill materials

temporary pavement repairs and maintenance

temporary and permanent removal and replacement of pavement, curb, drainage structures, driveways, sidewalks and any other improvements damaged or removed during construction

cleanup

vertical stack on deep wastewater services

all other incidentals necessary to complete the pipe installation as indicated.

pipe joint restraint devices, where specified or allowed, meeting Standard Products Lists 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 including 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 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.

(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.

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___x___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___x___Dia.:** | Pressure Taps, ___ Dia. X ___ Dia. | Per Each. |
| **Pay Item No. 510 - JR___x___Dia.:** | Wet Connections, ___ Dia. x ___ Dia. | Per Each. |
| **Pay Item No. 510 - KR:** | Ductile Iron Fittings | Per Ton. |
| **Pay Item No. 510-ASD___Dia.:** | Pipe, __Dia. Type (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___x___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___x___Dia.** | Pressure Taps, ___ Dia. X ___ Dia. | Per Each. |
| **Pay Item No. 510-JW___x___Dia.:** | Wet Connections, ___ Dia. x ___ 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___x___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-** | Pipe Trench Backfill, ____Ft. Width | Per Linear Foot. |

**DWW:**

| | | |
|---|---|---|
| **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. |

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.

**End**

Applicable References:

Standard Specifications Manual: Item Nos. Ref: 102S, 210S, 402S, 403S, 501S, 505S, 506, 507S, 509S, 593S, 601S, 604S

Standards Manual: Standard Detail Nos. 510S-1, (520 - series).

Design Criteria Manuals: Utilities Criteria Manual, Section 5.

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## 511S.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 (102 mm) 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 (0.2 mm) 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 (0.6 meters) below the proposed ground or paving surface of the finished project. Laydown valves shall not be used unless indicated otherwise on the Drawings by call out. Standard details shall not be an indicator of options.

This specification is applicable for projects or work involving either inch-pounds or SI units. Within the text, inch-pound units are given preference followed by SI units shown within parentheses.

## 511S.2 Materials

The Contractor shall submit descriptive information and evidence that the materials and equipment the Contractor proposes for incorporation in the Work is of the kind and quality that satisfies the specified functions and quality. The City of Austin Water and Wastewater Utility Standard Products Lists (SPL) are considered to form a part of these Specifications. Contractors may, when appropriate, elect to use products from the SPL; however, submittal to the Engineer/Architect (E/A) is still required. If the Contractor elects to use any materials from these lists, each product shall be completely and clearly identified by its corresponding SPL number when making the product submittal. This will expedite the review process in which the E/A, and, if necessary, the Water and Wastewater Utility Standard Products Committee, decide whether the products meet the Contract requirements and the specific use foreseen by the E/A in the design of this engineered Project.

The SPL's should not be interpreted as being a pre-approved list of products necessarily meeting the requirements for a given construction Project. Items contained in the SPL cannot be substituted for items shown on the Drawings, or called for in the specifications, or specified in the Bidding Requirements, Contract Forms and Conditions of Contract, unless approved by the E/A in conjunction with the Water and Wastewater Utility Standard Products Committee. The Standard Product List current at the time of plan approval will govern.

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.

**511S.3 Valves**

A) Iron-Body Gate Valves

Resilient-seated gate valves for potable or reclaimed service, including tapping valves, shall conform to AWWA C-509 and Standard Products List item WW-282.

Reduced-wall, resilient-seated gate valves for potable or reclaimed service, including tapping valves, shall conform to AWWA C-515 and Standard Products List item WW-700,

Metal-seated gate valves for potable or reclaimed service, including tapping valves, shall conform to AWWA C-500 and Standard Products List item WW-132.

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" (50 mm) square operating nut, or with a spoke type handwheel when so ordered, turning clockwise to close.

3) Gearing: Gate valves in 24 inch (610 mm) 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, 16 inch (406 mm) 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.

   Tapping valves shall have inlet flanges conforming to MSS SP-60, with boltholes drilled per ANSI B16.1 Class 125. Seat rings and body casting shall be over-sized as required to accommodate full size cutters; the outlet end shall be constructed and drilled to allow the drilling machine adapter to be attached directly to the valve.

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 16 inch (406 mm) 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) Butterfly Valves:

Unless otherwise indicated, all valves shall conform to the current "AWWA" Standard C-504, "Rubber-Seated Butterfly Valves", Class 150B, except as modified or supplemented herein.

1) Functional Requirements

a). Valves shall be the short body design and shall have flanged connections on both ends unless otherwise called for.

b). Valves shall be of such design that the valve discs will not vibrate or flutter when operated in a throttled position. Valve discs shall be secured to the shafts by means of keys or pins so arranged that the valve discs can be readily removed without damage thereto. All keys and pins used in securing valve discs to shafts shall be stainless steel or monel. Valve discs shall be stainless steel or ductile iron, ASTM A 536, Grade 65-45-12 (448-310-12); seating edge shall be stainless steel or other corrosion resistant material.

c). Valve shafts shall be constructed of wrought stainless steel or monel. The ends of the shaft shall be permanently marked to indicate the position of the disc on the shaft.

d). All buried valves shall have approved manufacturer's O-ring type or split V type "Chevron" shaft seals. When O-ring seals are used, there shall be at least two O-rings in contact with the valve shaft where it penetrates the valve body.

On 24 inch (635 mm) and larger valves, the seat shall be completely replaceable and/or adjustable with common hand tools without disassembling the valve from the pipeline.

Rubber seats located on the valve disc shall be mechanically secured with stainless steel retainer rings and fasteners.

e). Unless otherwise indicated, valves shall be provided with manual operators with vertical stems and 2 inches (50 mm) square operating nut turning clockwise to close and equipped with a valve disc position indicator. All keys or pins shall be stainless steel or monel. Buried valves shall have the valve stems extended or adjusted to locate the top of the operating nut no more than 24 inches (0.6 meter) below finish grade.

f). Unless otherwise indicated, motorized butterfly valves shall be equipped with 230/460 volt, 3-phase reversing motor operators, extended as required to locate the center line of the operator shaft approximately 4 feet to 4 feet, 6 inches (1.2 to 1.4 meters) above finish grade. Operators shall be equipped with cast iron or malleable iron manual override hand wheel with a valve position indicator, local push button controls, lighted status/position indicator, torque and travel limit switches and all switches, relays and controls (except external power and signal wiring) necessary for both local and remote operation.

2) Performance Requirements

a). Unless otherwise indicated, valve operators shall be sized to seat, unseat, open and close the valve with 150 psi (1 megapascal) shutoff pressure differential across the disk and allow a flow velocity of 16 feet (4.9 meters) per second past the disc in either direction.

b). Motorized valve motors shall be capable of producing at least 140 percent of the torque required to operate the valves under conditions of maximum non-shock shutoff pressure without exceeding a permissible temperature rise of $131^0$F over

$104^0$F ambient (55 degrees Celsius over 40 degrees Celsius ambient); they shall have a duty rating of not less than 15 minutes and shall be capable of operating the valve through 4 1/2 cycles against full unbalanced pressure without exceeding the permissible temperature rise. Motors shall be suitable for operating the valve under maximum differential pressure when voltage to motor terminals is 80 percent of nominal voltage. Motor bearings shall be permanently lubricated and sealed.

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 150 psi (1 megapascal) {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 1000 psi (6.9 megapascals).

Unless otherwise indicated, these valves shall be as included in the Standard Products List (SPL WW-367 for water, 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 1/4" (133 mm) opening, closing with line pressure. Approved models are listed on SPL WW-3 of the Water and Wastewater Utility Standard Products List.

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 (102 mm) Fire Hose Connection Standard (Available upon request from the Austin Water Utility's Standards Committee Chairperson at 972-0204).

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 (1.38 megapascals) and a test pressure of 400 psi (2.76 megapascals).

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 four (4) feet (1.2 meters) minimum, five (5) feet (1.5 meters) 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 6 corrosion resistant bolts.

Hydrant Main Valve shall be 5 1/4 inch (133 mm) I.D. Valve stem design shall meet requirements of AWWA C502, with Operating Nut turning clockwise to close. Operating Nut shall be pentagonal, 1 1/2 inch (38 mm) point to flat at base, and 1 7/16 inches (36.5 mm) at top and 1 inch (25 mm) 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 (2) 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 (450 mm) above ground. Each hydrant shall have two (2) 2 1/2 inch (63.5 mm) nozzles 180 degrees apart with National (American) Standard Fire Hose Coupling Screw Thread NFPA 1963 and one (1) 4 inch (102 mm) pumper nozzle with City of Austin standard thread–six (6) threads per inch (25 mm) "Higbee" cut, 4.8590 inch (123.4 mm) O.D., 4.6425 inch (117.9 mm) 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 (0.6 to 0.9 meters) 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 City of Austin 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 City of Austin Water and Wastewater Standard Products List (SPL).

G) Drain Valves:

Drain valve materials and installation shall conform to City of Austin Standard Detail No. 511S-9A.

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.

## 511S.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 confict 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 (150 mm) 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 City of Austin "Standard Detail Drawings- Series 500/500S"). 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 511S-17, with outermost point of large nozzle cap 6" to 18" (150 mm to 450 mm) 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 (0.9 meters), nor more than 6 feet (1.8 meters), except that no part of a hydrant or its nozzle caps shall be within 6 inches (150 mm) of any sidewalk or pedestrian ramp. Any fire hydrant placed near a street corner shall be no less than 20 feet (6 meters) from the curb line

point of tangency. Fire hydrants shall not be installed within nine feet (2.75 meters) vertically or horizontally of any sanitary sewer line regardless of construction.

All hydrants shall stand plumb; those near curbs shall have the 4-inch (102 mm) 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 (450 mm) above grade. Lower barrel length shall not exceed 5 feet (1.5 meters). Barrel extensions are not permitted unless approved by the Engineer or designated representative. Each hydrant shall be connected to the main by 6-inch (152 mm) ductile iron pipe; a 6-inch (152 mm) gate valve shall be installed in the line for individual shutoff of each new hydrant.

Below each hydrant, a drainage pit 2 feet (0.6 meter) in diameter and 2 feet (0.6 meter) 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 (City of Austin Specification Item 510 and Standard Detail 510-6 and to a level 6 inches (150 mm) 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 (0.2 mm) low density polyethylene film or a minimum 4-mil (0.1 mm) 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 City of Austin Standards 511S-9A.

H) Air Release Assemblies:

Refer to City of Austin Standards 511S-1A, 511S-1B, 511S-2A, 511S-2B, 511S-3A and 511S-3B.

I) Pressure/Flow Control Valves:

Assemblies shall be installed as indicated.

J) Connections to Existing System:

Refer to Item No. 510, "Pipe" for connections to the existing system.

K) Shutoffs:

Refer to Item No. 510, "Pipe" for shutoffs.

**511S.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 (meter: 1 meter equals 3.28 feet). Pressure/Flow control valve assemblies and both manual and automatic air release assemblies will be measured per each. Reflectorized pavement markers for identifying the location of newly installed fire hydrants shall be measured per each, as per Standard Specification Item No. 863S.7.

Bury depths exceeding 5.5 feet (1.68 meters) 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.

**511S.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 at the unit bid price, including box or vault, setting, adjusting to grade, anchoring in place,

adjusting the control device to the required conditions, providing other appurtenances necessary for proper operation, and placing in operation.

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, 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 (1.68 meters).

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. 511S-A**: | Valves, _____ Type, _____Diameter | Per Each. |
| **Pay Item No. 511S-B**: | Fire Hydrants (See Standard No. 511S-17) | Per Each. |
| **Pay Item No. 511S- C**: | Pressure or Flow Control Valve Assemblies | Per Each. |
| **Pay Item No. 511S- D**: | Drain Valve Assemblies (See Standard No. 511S-9A) | Per Each. |
| **Pay Item No. 511S- E**: | Manual Air Release Assemblies, ____Diameter | Per Each. |
| **Pay Item No. 511S- F**: | Automatic Combination Air/Vacuum Release Valve Assembly, _____ Diameter. | Per Each. |
| **Pay Item No. 511S- G**: | Additional Bury Depth | Per Vertical Foot. |
| **Pay Item No. 511S-H:** | Fire Hydrant Barrel Extensions | Per Vertical Foot |

**END**

| **SPECIFIC** CROSS REFERENCE MATERIALS |
|---|
| Specification 511S, "Water Valves" |

City of Austin Standard Specification Items

| Designation | Description |
|---|---|
| Item No. 510 | Pipe |
| Section-510.3 (22) | Pipe Anchorage, Support and Protection |
| Section-510.3(24) | Water System Connections |

City of Austin Standard Details

| Designation | Description |
|---|---|
| 511S-1A | 25 mm (1") – 76 mm (2") Vented Air Release Valve Installation (Type I) |
| 511S-1B | 25 mm (1") – 76 mm (2") Non-Vented Air Release Valve Installation (Type I) |
| 511S-2A | Type II - 76 mm (3") or Larger Vented Air/Vacuum Valve Installation |

| | |
|---|---|
| 511S-2B | Type II - 76 mm (3”) or Larger Non-Vented Air/Vacuum Valve Installation |
| 511S-3A | Type III - 76mm (3”) or Larger Vented Air/Vacuum Valve Installation |
| 511S-3B | Type III-76mm (3”) or Larger Non-Vented Air/Vacuum Valve Installation |
| 511S-9A | Drain Valve Assembly |
| 511S-17 | Standard Fire Hydrant Installation |

**SPECIFIC** CROSS REFERENCE MATERIALS (Continued)
Specification 511S, “Water Valves”

City of Austin W/WW Standard Products

| Designation | Description |
|---|---|
| WW-3 | Standard Products List for Fire Hydrants |
| WW-132 | Standard Products List for Metal-Seated Gate Valves, AWWA C-500 |
| WW-282 | Standard Products List for Resilient-Seated Gate Valves, AWWA C-509 |
| WW-367 | Standard Products List for Air Release Valves for Water |
| WW-462 | Standard Products List for Air Release/Vacuum Relief Valves for Wastewater |
| WW-700 | Standard Products List for 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 |
| C-509 | Resilient Seated Gate Valves for Water and Sewerage Systems |
| C-515 | Reduced-Wall, Resilient-Seated Gate Valves For Water Supply Service |

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 511S, “Water Valves”

City of Austin Standard Specification Items

| Designation | Description |
|---|---|
| Item No. 501S | Jacking or Boring Pipe |
| Item No. 503S | Frames, Grates, Rings and Covers |
| Item No. 505S | Concrete Encasement and Encasement Pipe |
| Item No. 506S | Manholes |
| Item No. 507S | Bulkheads |
| Item No. 508S | Miscellaneous Structures and Appurtenances |
| Item No. 509S | Excavation Safety Systems |

**Item No. 601S**
**Salvaging and Placing Topsoil**

## 601S.1 Description

This item shall govern the removal, storage and placement of approved topsoil to the depths and area shown 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 and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

## 601S.2 Submittals

The submittal requirements of this specification item shall include the test results and soil classification necessary for approval of material as suitable topsoil.

## 601S.3 Materials

A. Topsoil

1. The topsoil shall be composed of 4 parts of soil mixed with 1 part compost, by volume. The compost shall meet TxDOT Specification Item 161. The soil shall be locally available native soil that meets the following specifications:
   - Shall be free of trash, weeds, deleterious materials, rocks and debris.
   - 100% shall pass through a 1.5-inch (38-mm) screen.
   - Soil to be a loamy material that meets the requirements of the table below in a accordance with the USDA textural triangle. Soil known locally as “red death” is not an allowable soil. Textural composition shall meet the following criteria:

| Textural Class | Minimum | Maximum |
|---|---|---|
| Clay | 5% | 50% |
| Silt | 10% | 50% |
| Sand | 15% | 67% |

   - An owner/engineer may propose use of onsite salvaged topsoil which does not meet the soil texture class required above by providing a soil analysis and a written statement from a qualified professional in soils, landscape architecture, or agronomy indicating the onsite topsoil will

provide an equivalent growth media and specifying what, if any, soil amendments are required.

- Soil amendments shall be worked into the existing onsite topsoil with a disc or tiller to create a well-blended material.

2. All disturbed areas to be revegetated are required to provide a minimum of six (6) inches of topsoil. The topsoil shall be able to support the growth of planting (Standard Specification Item No. 608S), seeding (Standard Specification Item No. 604S), sodding (Standard Specification Item No. 602S) and native grassland seeding and planting (Standard Specification Item No. 609S).

B. Water

Water shall be furnished by the Contractor and shall be clean and free from industrial wastes and other objectionable matter.

## 601S.4 Sources

The topsoil may be obtained from the right-of-way at sites of proposed excavation or embankment when shown on the Drawings or identified by the Engineer or designated representative. The approximate quantity of acceptable topsoil to be salvaged from the project will be shown on the Drawings. The topsoil may also be obtained from approved sources, which are located outside the right-of-way and have been secured by the Contractor.

## 601S.5 Construction Methods

Precautions will be maintained at all times to protect all trees in the area of construction. Where removal of trees is indicated on the Drawings, they shall be marked as directed by the Engineer or designated representative.

Construction equipment shall not be operated nor construction materials stockpiled under the canopies of trees, unless otherwise indicated on the Drawings and/or specified in the Contract Documents. Topsoil materials shall not be placed within the drip line of trees until tree wells are constructed that conform to Item No. 610S, "Preservation of Trees and Other Vegetation " and Standard Details 591S-1 and 610S-6. The source and stockpile areas shall be kept drained, insofar as practicable, during the period of topsoil removal

The existing topsoil shall be removed from the area indicated on the Drawings, stockpiled in a windrow along the right of way or spread over an area that is ready for topsoil application in accordance with the Drawings or as directed by the Engineer or designated representative.

Trash, wood, brush, stumps, rocks over 1 1/2 inches (37.5 mm) in size and other objectionable material encountered shall be removed and disposed of as directed by the Engineer or designated representative prior to beginning of work required by this item.

Grass and other herbaceous plant materials may remain. Large clumps shall be broken up.

After the grading has been completed to the required alignment, grades and cross-sections and prior to the spreading of the salvaged topsoil, any clay or tight soil surfaces shall be scarified by plowing furrows approximately 4 inches (100 mm) deep along horizontal slope lines at 2 foot (600 mm) vertical intervals. The spreading of the salvaged topsoil shall be undertaken as soon as the grading has been completed. The topsoil shall be spread so as to form a cover of uniform thickness indicated. After the topsoil has been placed and shaped, it shall be sprinkled and rolled to provide a suitable seed bed.

### 601S.6 Measurement and Payment

Salvaging, removal and/or placing topsoil materials will not be measured for payment, but shall be included in the unit price bid for the item of construction in which these activities are used.

**End**

| **SPECIFIC** CROSS REFERENCE MATERIALS |
|---|
| Specification 601S, "Salvaging and Placing Topsoil" |

**City of Austin Standard Specification Items**

| Designation | Description |
|---|---|
| Item No. 602S | Sodding for Erosion Control |
| Item No. 604S | Seeding for Erosion Control |
| Item No. 608S | Planting |
| Item No. 609S | Native Grassland Seeding and Planting For Erosion Control |
| Item No. 610S | Preservation of Trees and Other Vegetation |

**City of Austin Standard Details**

| Designation | Description |
|---|---|
| 591S-1 | Dry Stack Rock Wall |
| 610S-6 | Typical Tree Well Applications |

| ***RELATED*** CROSS REFERENCE MATERIALS |
|---|
| Specification 601S, "Salvaging and Placing Topsoil" |

**City of Austin Standard Specification Items**

| Designation | Description |
|---|---|
| Item No. 102S | Clearing and Grubbing |

| | |
|---|---|
| Item No. 104S | Removing Concrete |
| Item No. 110S | Street Excavation |
| Item No. 111S | Excavation |
| Item No. 120S | Channel Excavation |
| Item No. 132S | Embankment |
| Item No. 606S | Fertilizer |

**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 |

**Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges**

| Designation | Description |
|---|---|
| Item No. 100 | Preparing Right of Way |
| Item No. 110 | Excavation |
| Item No. 160 | Furnishing and Placing Topsoil |
| Item No. 164 | Seeding for Erosion Control |
| Item No. 204 | Sprinkling |

**Texas Department of Transportation: Manual of Testing Procedures**

| Designation | Description |
|---|---|
| Tex-103-E | Determination of Moisture Content of Soil Materials |
| Tex-104-E | Determination of Liquid Limit of Soils |
| Tex-105-E | Determination of Plastic Limit of Soils |
| Tex-106-E | Method of Calculating the Plasticity Index of Soils |

**Item No. 602S**
**Sodding for Erosion Control**

## 602S.1 Description

This item shall govern planting of Bermuda grass; St. Augustine or other acceptable grass sod at locations indicated on the Drawings or as directed by the Engineer or designated representative in accordance with this Standard Specification Item.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

## 602S.2 Submittals

The submittal requirements for this specification item shall include the identification of the type and source of sodding, the type of mulch, type of tacking agent and type and rate of application of fertilizer.

## 602S.3 Materials

A. Block and Mulch Sod

The sod shall consist of live, growing Bermuda Grass, St. Augustine grass, when shown on the Drawings, or other acceptable grass sod indicated on the Drawings secured from sources that are approved by the Engineer or designated representative. Bermuda Grass sod, St. Augustine sod or other grass sod as shown on the Drawings shall have a healthy, virile root system of dense, thickly matted roots throughout the soil of the sod for a minimum thickness of 1 inch (25 millimeters). The thickness measure does not include grass. The sod shall be cut in rectangular pieces with its shortest side not less than 12 inches (300 mm). The Contractor shall not use sod from areas where the grass is thinned out nor where the grass roots have been dried out by exposure to the air and sun to such an extent as to damage its ability to grow when transplanted.

The sod shall be substantially free from noxious weeds, Johnson grass or other grasses and shall not contain any matter deleterious to its growth or which might affect its subsistence or hardiness when transplanted. Unless the area has been closely pastured, it shall be closely mowed and raked to remove all weeds and long standing stems. Sources from which sod is to be secured shall be approved by the Engineer or designated representative.

Care shall be taken at all times to retain the native soil of the roots of the sod during the process of excavating, hauling and planting. Sod material shall be kept moist from the time it is dug until it is planted. The sod existing at the source shall be watered to the extent required by the Engineer or designated representative prior to excavating.

B. Fertilizer

Fertilizer and the rate of application shall conform to the requirements of Standard Specification Item No. 606S, "Fertilizer".

C. Mulch

Straw mulch shall be oat, wheat or rice straw. Hay mulch may be substituted for straw mulch and shall be Prairie Grass; Bermuda grass or other hay approved by the Engineer or designated representative. The hay or straw mulch shall be free of Johnson grass or other noxious weeds and foreign materials. It shall be kept in a dry condition and shall not be molded or rotted.

D. Water

Water shall be furnished by the Contractor and shall be clean and free of industrial wastes and other substances harmful to the growth of sod or to the area irrigated.

E. Tacking Agents

Tacking agents for straw or hay mulch shall be as shown on the Drawings.

**602S.4 Planting Season**

All planting shall be done between April and November except as specifically authorized in writing by the Engineer or designated representative.

**602S.5 Construction Methods**

A. General

After the designated areas have been completed to the lines, grade and cross sections indicated on the Drawings, the surface shall be worked to a depth of not less than 4 inches (100 mm) with a disc, tiller or other equipment approved by the Engineer or designated representative. Fertilizer nutrients shall be applied and tilled. Areas that become crusted shall be reworked to an acceptable condition before sodding. Sodding of the type specified shall conform to the requirements of this Specification Item. The Contractor shall give continuous care to the sodded area until the sod is accepted.

B. Placement

The sod shall be placed on the prepared surface with the edges in close contact and alternate courses staggered. In ditches the sod shall be placed with the longer dimension perpendicular to the flow of water in the ditch. On slopes, starting at the bottom of the slope, the sod shall be placed with the longer dimension parallel to the contours of the ground. The exposed edges of sod shall be buried flush with the adjacent soil. On slopes exceeding 3:1 or where the sod may be displaced, the sod shall be pegged with not less than 4 stakes or ground staples per square yard (square meter) with at least 1 stake or ground staple for each piece of sod.

Pegs shall be of wood lath or similar material, pointed and driven with the flat side against the slope, 6 inches (150 mm) into the ground, leaving approximately 1/2 inch (12.5 mm) of the top above the ground. Ground staples shall not be less than

13 inches (330 mm) in length and shall be constructed of No. 11 gage (3 mm) wire that is bent to form a "U" approximately 1 inch (25 mm) in width.

C. Watering

Immediately after the area is sodded, it shall be watered with a minimum of 5 gallons of water per square yard (22.5 liters per square meter) and at 10 day intervals as needed and as directed by the Engineer or designated representative. Subsequent to the initial application water shall be applied at a minimum rate of 3 gallons per square yard (13.5 liters per square meter), as required on the Drawings or as directed by the Engineer or designated representative until final acceptance by the City or until the grass uniformly reaches a height of 2 1/2 inches (62.5 mm).

Availability of water from the Austin Water Utility will be limited as stated under the Water Conservation Standard, City of Austin Land Development Code Chapter 6-2, Article II, " Water Use Management Plan Established".

The use of potable water will be restricted as stated in City of Austin Land Development Code Sections 6-4-73, 6-4-54, 6-4-63, 6-4-64, 6-4-65, 6-4-81, 6-4-92, 15-9-37(D) and 15-9-101(B).

D. Finishing

Where applicable, the shoulders, slopes and ditches shall be smoothed after planting has been completed and shaped to conform to the desired cross sections shown on the Drawings. Any excess soil from planting operations shall be spread uniformly over adjacent areas or disposed of as directed by the Engineer or designated representative so that the completed surfaces will present a neat appearance. All sodded areas shall be rolled after the initial watering application, when sufficiently dry.

### 602S.6 Block Sodding

At locations indicated on the Drawings or where directed by the Engineer or designated representative, sod blocks shall be carefully placed on the prepared areas. The fertilizer shall then be applied in accordance with the applicable provisions of Item No. 606S, "Fertilizer" and thoroughly watered. When sufficiently dry, the sodded area shall be rolled or tamped to form a thoroughly compacted, solid mat. Any voids left in the block sodding shall be filled with additional sod and tamped. Surfaces of block sod which, in the opinion of the Engineer or designated representative may slide due to the height and slope of the surface or nature of the soil, shall be pegged with wooden pegs driven through the sod blocks into firm earth sufficiently close to hold the block sod firmly in place. Edges along curbs and drives, walkways, etc., shall be carefully trimmed and maintained until the sodding is accepted.

### 602S.7 Mulch Sodding

The sod source shall be disked in 2 directions cutting the sod thoroughly to a depth of not less than 4 inches (100 mm). Sod material shall be excavated to a depth of not more than 2 inches (50 mm) below the existing root system, being careful to avoid having soil containing no grass roots. The disked sod may be windrowed or otherwise

handled in a manner satisfactory to the Engineer or designated representative. The material shall be rejected if not kept in a moist condition.

Prior to placement of mulch sod, the cut slopes shall be scarified by plowing furrows 4 inches (100 mm) to 6 inches (150 mm) deep along horizontal slope lines at 2 foot (600 mm) vertical intervals. Excavated material from the furrows shall not protrude more than 3 inches (75 mm) above the original surface of the cut. Fertilizer shall be distributed uniformly over the area in accordance with the applicable provisions of Item No. 606S, "Fertilizer". The sod shall then be deposited upon the prepared area and spread uniformly to the thickness indicated on the Drawings.

Any section that is not true to lines and cross sections shall be remedied by the addition of sod material or by reshaping the material to meet the requirements of "Finishing"[Section 602S.5 (4)]. After the sod material has been spread and shaped, it shall be thoroughly wetted and compacted with a corrugated roller of the "Cultipacker" type. All rolling of slope areas shall be on the contour.

### 602S.8 Measurement

Work and acceptable material for "Sodding for Erosion Control" will be measured by the square yard (square meter: 1 square meter is equal to 1.196 square yards) complete in place with a minimum of 95 percent growth with a 2 1/2 inch (62.5 mm) stand of grass.

### 602S.9 Payment

The work performed and materials furnished and measured as provided under "Measurement" will be paid for at the unit bid price for Bermuda Block Sodding", "St. Augustine Block Sodding", "Bermuda Mulch Sodding" or "Other Approved Grass Sodding". The prices shall each represent full compensation for completion of the work including all water applications, rolling, pegging and fertilizer as indicated on the Drawings.

Payment will be made under one of the following:

| | | |
|---|---|---|
| **Pay Item No. 602S-A:** | Bermuda Block Sodding - | Per Square Yard. |
| **Pay Item No. 602S-B:** | St. Augustine Block Sodding - | Per Square Yard. |
| **Pay Item No. 602S-C:** | Bermuda Mulch Sodding - | Per Square Yard. |
| **Pay Item No. 602S-D***:* | Grass Sodding - | Per Square Yard. |

**End**

| ***SPECIFIC*** CROSS REFERENCE MATERIALS |
|---|
| Specification 602S, “Sodding for Erosion Control” |

*City of Austin Land Development Code*

| *Designation* | *Description* |
|---|---|
| Chapter 4-2, Article II | Emergency and Peak Day Water Use Management |

*City of Austin Standard Specification Items*

| *Designation* | *Description* |
|---|---|
| Item No. 606S | Fertilizer |

*City of Austin Land Development Code*

| *Designation* | *Description* |
|---|---|
| Section 6-4-52 | Water Use Management Plan Established |
| Section 6-4-53 | Applicability |
| Section 6-4-54 | Compliance Required |
| Section 6-4-63 | Permanent Water Use Restrictions |
| Section 6-4-64 | Water Conservation Stage One Regulations |
| Section 6-4-65 | Water Conservation Stage Two Regulations |
| Section 6-4-81 | Variance |
| Section 6-4-92 | Penalty |
| Section 15-9-37(D) | Customer's Responsibilities |
| Section 15-9-101(B) | Basis for Termination of Service |

| ***RELATED*** CROSS REFERENCE MATERIALS |
|---|
| Specification 602S, "Sodding for Erosion Control" |

*City of Austin Standard Specification Items*

| *Designation* | *Description* |
|---|---|
| Item No. 110S | Street Excavation |
| Item No. 111S | Excavation |
| Item No. 120S | Channel Excavation |
| Item No. 132S | Embankment |
| Item No. 601S | Salvaging and Placing Topsoil |
| Item No. 604S | Seeding for Erosion Control |
| Item No. 608S | Planting |
| Item No. 610S | Preservation of Trees and Other Vegetation |

*Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges*

| *Designation* | *Description* |
|---|---|
| Item No. 100 | Preparing Right of Way |
| Item No. 110 | Excavation |
| Item No. 160 | Furnishing and Placing Topsoil |
| Item No. 162 | Sodding for Erosion Control |
| Item No. 164 | Seeding for Erosion Control |
| Item No. 166 | Fertilizer |
| Item No. 168 | Vegetative Watering |
| Item No. 204 | Sprinkling |

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**Item No. 604S**
**Seeding for Erosion Control**

## 604S.1 Description

This item shall govern the preparation of a seed bed for temporary or permanent erosion control; sowing of seeds; fertilizing; mulching with straw, cellulose fiber wood chips, and recycled paper mulch; and other management practices along and across such areas as indicated in the Drawings or as directed by the Landscape Architect, 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 with SI units shown within parentheses.

## 604S.2 Submittals

The following submittal items are required in writing during construction:

A. Identification of the seed species, source, mixture, and PLS of the seed as listed on the analysis tags and certification tags from all seed bags. Seed calculation worksheet per Table 9.

B. If fertilizer is proposed, results of a recent soil test (6 months old or less) of the area to be seeded, before fertilization. Soil samples shall be collected after final grading, when topsoil has been placed. The test results must include soil lab recommended additions of Nitrogen (N), Phosphorus (P), and Potassium (K) for the type of vegetation proposed, as well as soil organic matter percentage and textural class.

C. Fertilizer formulation and release rate based on a soil test (see B above).

D. For hydromulch applications, proposed application rate of seed, type of mulch and tacking agent, and other relevant information. An example of the required documentation is in Table 1.

E. Type of hydraulic seeding equipment and nozzles proposed for use.

F. If pesticide use is proposed, an IPM plan for pest removal including pesticide label, proposed application rate and timing, and MSDS sheets.

G. One gallon sample of proposed vegetative mulch.

The following submittal items are required before Substantial Completion:

A. For hydromulch applications, the complete hydromulch application log, including date, time and quantity of product units placed in the slurry tank. An example of an application log is provided in Table 2. This log may be requested at any time during construction by the Landscape Architect, Engineer, or designated representative.

B. Pesticide application tracking log. As of January 1, 2012, documentation of all outdoor pesticide use on city-owned properties is required to demonstrate compliance with the EPA/TCEQ mandated Municipal Stormwater Permit, the TPDES General Pesticide Permit, City Code, and the IPM program.

Table 1: Example of proposed hydromulch application rates

| | | | | Hydro Slurry Unit (per acre rates) | | | | |
|---|---|---|---|---|---|---|---|---|
| Hydro Mix | Sheet No. | Seed Mix | Acres | Seed (Bags/ AC) | Tackifier (Buckets/ AC) | Mulch (Bales/ AC) | Fertilizer (Bags/ AC) | Addl. Amendments (Bags/AC) |
| 1 | L2 | A | 1.0 | 1 | 100 | 1000 | 50 | 5 |
| 2 | L3 | A | 0.5 | 2 | 200 | 1500 | 50 | 5 |
| 3 | L5 | B | 3.0 | 3 | 300 | 3000 | 50 | 5 |

Table 2: Example of hydromulch application log

| | | | | | | Hydro Slurry Unit (per acre rates) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date | Start Time | Finish Time | AC/ Tank | Water (gal) | Seed Mix | Seed (Bags/ AC) | Tackifier (Buckets /AC) | Mulch (Bales /AC) | Fertilizer (Bags/ AC) | Addl. Amend-ments (Bags/AC) |
| 4/13 | 10:30 | 11:15 | 1.0 | 3300 | A | 1 | 100 | 1000 | 50 | 5 |
| 4/17 | 2:00 | 2:30 | 0.5 | 3300 | A | 2 | 200 | 1500 | 50 | 5 |
| 5/20 | 8:30 | 10:00 | 1.2 | 3300 | B | 3 | 300 | 3000 | 50 | 5 |
| | | | | | Totals | 6 | 600 | 5500 | 127 | 15 |

**604S.3. Materials**

A. Seed. All seed must meet the requirements of the Texas Seed Law including the labeling requirements for showing pure live seed (PLS), name and type of seed and all other required elements of the Analysis and Certification Tags. PLS is the percentage of seed purity multiplied by the percentage of germination, plus dormant seed. The analysis tag, required on all seed sold in Texas, includes information on quality: kind and variety of seed, lot number, percent pure live seed, percent other crop seed, percent inert matter, percent weed seeds, germination percentage, and date of test. The certification tag also verifies seed quality, an assurance of seed variety and attesting to standards for germination and purity. Information provided includes class of certification, kind of crop, variety, lot number, and name and address of the owner.

The seed furnished shall be of the previous season's crop and the date of analysis shown on each bag shall be within twelve (12) months of the time of delivery to the

project. Each variety of seed shall be furnished and delivered in separate bags or containers, unless a specific mix is proposed for use. A sample of each variety of seed shall be furnished for analysis and testing when directed by the Landscape Architect, Engineer or designated representative.

The amount of seed planted square yard (0.84 square meters) or per acre (hectare) shall be of the type specified in sections 604S.5 and 604S.6.

B. Water. Water shall be clean and free of industrial wastes and other substances harmful to the growth of plant material or the area irrigated.

C. Top soil. Top soil shall conform to Standard Specification Item No. 601S.3(A).

D. Fertilizer. The fertilizer shall conform to Standard Specification Item No. 606S, "Fertilizer". The type and rate of fertilizer should be based on chemical tests of recent (no older than 6 months before application) representative site soil samples. Fertilizer should be applied only when plants can take them up for growth, during: 1) seed germination and plant establishment and 2) after plant establishment. Fertilizer shall not be applied within 48 hours of a potential rain event.

E. Straw Mulch or Hay Mulch. Straw Mulch shall be oat, wheat or rice straw. Hay mulch shall be prairie grass, or other hay approved by the Landscape Architect, Engineer or designated representative. The straw or hay shall be free of Johnson grass or other noxious weeds and foreign materials. It shall be kept in a dry condition and shall not be moldy or rotted.

F. Tackifier. The tackifier shall be a biodegradable tacking agent, approved by the Landscape Architect, Engineer or designated representative.

G. Cellulose Fiber Mulch (Natural Wood). Cellulose Fiber Mulch shall be natural cellulose fiber mulch produced from grinding clean whole wood chips. The mulch shall be designed for use in conventional mechanical planting, hydraulic planting of seed or hydraulic mulching of grass seed, either alone or with fertilizers and other additives. The mulch shall be such, that when applied, the material shall form a strong, moisture-retaining mat without the need of an asphalt binder.

H Recycled Paper Mulch. Recycled paper mulch shall be specifically manufactured from post-consumer paper and shall contain a minimum of 85% recycled paper content by weight, shall contain no more than 15% moisture and 1.6% ash, and shall contain no growth inhibiting material or weed seeds. The recycled paper mulch shall be mixed with grass seed and fertilizer (see “fertilizer” above) for hydro-seeding/mulching, erosion control, and a binder over straw mulch. The mulch, when applied, shall form a strong, moisture-retaining mat of a green color without the need of an asphalt binder.

I. Mulch. Mulches, acting as seed coverings, can enhance seed germination and seedling establishment. Characteristics of ideal mulches for seeding are those that protect seeds from wind (drying), excessive solar radiation, high evapotranspiration rates, and erosion, while allowing germination and growth. Relatively coarsely shredded, weed-free vegetative mulch should be used on seed installations, especially in open, sunny areas. These materials shall be clean, free of foreign matter, and dry enough to spread evenly.

J. Pesticide. A least toxic, integrated pest management (IPM) approach shall be used to control weeds. A written request for approval of weed control products and materials shall be submitted to the City of Austin IPM program coordinator (512-974-2581) for approval. Additional information can be found at http://www.austintexas.gov/ipm.

## 604S.4 Construction Methods

A. General. The Contractor shall limit preparation of the seedbed to areas that will be seeded immediately. When seeding for permanent erosion control, weed species listed in Table 3 shall be managed by application of an appropriate herbicide and/or by physical removal by the roots before the seeding operation. The goal of weed management is to facilitate establishment of the permanent vegetative cover. Additionally, the Owner may require removal of any plant species that appears to be out-competing seeded or planted species during the construction period.

Table 3: Weed List

| **Weed Type** | **Botanical Name** | **Common Name** |
|---|---|---|
| Perennial Grass | *Sorghum halapense* | Johnsongrass |
| Perennial Grass | *Arundo donax* | Giant Cane |
| Perennial Grass | *Phyllostachys aurea* | Golden Bamboo |
| Summer Annual Herb | *Ambrosia trifida* | Ragweed |
| Winter Annual Herb | *Rapistrum rugosum* | Bastard Cabbage |
| Winter Annual Herb | *Bromus unioloides* | Rescue Grass |
| Winter Annual Herb | *Bromus arvensis* | Japanese Brome |
| Winter Annual Herb | *Lolium multiflorum* | Annual Ryegrass |

B. Preparing Seed Bed. After the designated areas have been rough graded to the lines, grades and typical sections indicated in the Drawings or as provided for in other items of this contract and for any other soil area disturbed by the construction, a suitable seedbed shall be prepared. The seedbed shall consist of a minimum of either 6 inches (150 millimeters) of approved topsoil or 6 inches (150 millimeters) of approved salvaged topsoil. The topsoil or growing medium must be prepared so that compaction is appropriate for plant growth, and to achieve acceptable bulk density or hydrologic function. Rippers and subsoilers may be used to loosen compacted soil and roughen the surface. Disks, plows and excavator attachments are good for compaction reduction, roughening and incorporating amendments. A roughened soil surface of micro-ridges and valleys is an optimal seed bed with a microenvironment of increased moisture, higher humidity, wind protection, and shelter from the sun for seeds. If tracked machinery is used in seedbed preparation, cleat marks should run with the contour to prevent rills. The optimum depth for seeding shall be 1/4 inch (6 millimeters).

Water shall be gently applied as required to prepare the seedbed prior to the planting operation either by broadcast seeding or hydraulic planting. Seeding shall be performed in accordance with the requirements described below.

C. Watering. All watering shall comply with City Ordinances and regulations. All seeded areas regardless of seed type and method of seeding (e.g., broadcast, hydroseed) shall be watered immediately after installation. For seed germination and establishment it is important to keep the seedbed in a moist condition favorable for the growth of plant materials.

Watering applications shall constantly maintain the seedbed in a moist condition favorable for the growth of plant materials. Watering shall continue until the plant material is at least 1-1/2 inches (40 mm) in height and accepted by the Landscape Architect, Engineer or designated representative. Supplemental watering can be postponed immediately after a half- inch (12.5 mm) or greater rainfall on the site but shall be resumed before the soil dries out.

Availability of water for irrigation from the Austin Water Utility will be limited as stated under the Water Conservation Code, City of Austin Land Development Code Chapter 6-4, “Water Conservation”.

D. Cool Season Cover Crop. From September 15 to March 1, non-native and native seeding shall include a cool season cover crop at the rate specified in Table 8. Cool season cover crops are not permanent erosion control. If installed separately from the permanently erosion control seed mix, the cool season cover crops shall be mowed to a height of less than one (1) inch after March 1, and the area shall be re-seeded at the specified seeding rate for non-native or native warm-season species (March 1 to September 15).

**604S.5 Non-Native Seeding**

A. Method A - Broadcast Seeding. The seed or seed mixture in the quantity specified shall be uniformly distributed over the prepared seed bed areas indicated on the Drawings or where directed by the Engineer or designated representative. If the sowing of seed is by hand, rather than by mechanical methods, the seed shall be sown in two directions at right angles to each other. If mechanical equipment is used, all varieties of seed, as well as fertilizer (if required), may be distributed at the same time, provided that each component is uniformly applied at the specified rate. After planting, the planted area shall be rolled with a corrugated roller of the "Cultipacker" type. All rolling of the slope areas shall be on the contour.

Seed Mixture and Rate of Application for Broadcast Seeding:

<u>From March 1 to September 15</u>, seeding shall be with hulled Bermuda Grass at a rate of 45 lbs/AC (5.0 kilograms per hectare) with a minimum PLS = 0.83. Fertilizer shall be applied if warranted by a soil test, and shall conform to Item No. 606S, "Fertilizer". Bermuda grass is a warm-season grass and is therefore considered permanent erosion control once established.

B. Method B - Hydraulic Planting. The seedbed shall be prepared as specified above and hydraulic planting equipment, which is capable of placing all materials in a single operation, shall be used.

March 1 to September 15

Hydraulic planting mixture and minimum rate of application pounds per acre or square yard (kilograms per ha):

| Hulled Bermuda Seed (min. PLS=0.83) | Fiber Mulch | | Soil Tackifier |
|---|---|---|---|
| | Cellulose | Wood | |
| 45 Lbs/AC (50.44 kg/ha) | 2000 Lbs/AC (2242 kg/ha) | | 60.98 Lbs/AC (68.36 kg/ha) |
| | | 2500 Lbs/AC (2803 kg/ha) | 65.34 Lbs/AC (73.25 kg/ha) |

**604S.6 Native Grass and Forb Seeding**

The seed mixture shall include a diversity of grasses and wildflowers. The grass mix shall be seeded at a rate of 131 lb/AC (146.85 lb/ha) and shall include a minimum of 8 species from Table 4 (dry, open sites) or 6 species from Table 5 (wet, open sites). The species indicated with an asterisk shall be included in all proposed mixes. No species shall constitute more than 20% of a seed mix. Any species proposed for installation and not included in Tables 4 or 5 shall be approved by a landscape architect or other qualified landscape professional, and shall be native to Central Texas as referenced by the LBJ Wildflower Center plant database (www.wildflower.org) or USDA plant database.

Table 4: Native Grasses: Dry, Open Sites

| Common Name | Botanical Name | Exposure | Application rates | |
|---|---|---|---|---|
| | | | Lbs/AC | kg/ ha |
| Sideoats grama * | Bouteloua curtipendula | Full-pt sun | 7.0 | 7.8 |
| Green sprangletop * | Leptochloa dubia | Full sun | 6.0 | 6.7 |
| Buffalo Grass | Buchloe dactyloides | Full sun | 24.0 | 27.0 |
| Blue Grama Grass | Bouteloua gracilis | Full-pt sun | 10.0 | 11.2 |
| Canada Wild Rye | Elymus canadensis | Full-pt sun | 10.0 | 11.2 |
| Purple Three-Awn * | Aristida purpurea | Full sun | 4.0 | 4.5 |
| Cane Bluestem | Bothriochloa barbinodis | Full sun | 3.0 | 3.3 |
| Galleta | Pleuraphis jamesii | Full sun | 10.0 | 11.2 |
| Black Grama * | Bouteloua eripoda | Full sun | 10.0 | 11.2 |
| Sand Dropseed * | Sporobolus cryptandrus | Full sun | | |
| Alkali Sacaton | Sporobolus airoides | Full sun | 0.5 | 1.7 |
| Curly Mesquite | Hilaria belangeri | Full sun | 2.0 | 2.2 |
| Sand Lovegrass | Eragrostis trichodes | Full sun | 2.0 | 2.2 |

*These species must be included in the mix, plus an additional three (3) species from the list or other approved species, for a total of eight (8) species.

**Table 5: Native Grasses: Wet, Open Sites**

| Common Name | Botanical Name | Exposure | Application Rates | |
|---|---|---|---|---|
| | | | Lbs/AC | Kg/ha |
| White Tridens | *Tridens albescens* | Full-pt sun | 0.5 | 0.56 |
| Plains Bristlegrass | *Setaria leucopila* | Full-pt sun | 6.0 | 6.7 |
| Switchgrass | *Panicum virgatum* | Full-pt sun | 4.0 | 4.5 |
| Inland Sea Oats | *Chasmanthium latifolium* | Shade | 12.0 | 13.5 |
| Canada Wild Rye | *Elymus Canadensis* | Full sun – shade | 10.0 | 11.2 |
| Big Bluestem | *Andropogon gerardii* | Full sun | 4.0 | 4.5 |
| Bushy Bluestem | *Andropogon glomeratus* | Full sun | 3.0 | 3.4 |
| Green Sprangletop* | *Leptochloa dubia* | Full sun | 2.0 | 2.2 |
| Eastern Gamagrass | *Tripsacum dactyloides* | Full sun – shade | 3.0 | 3.4 |
| *This species must be included in the mix, plus an additional five (5) species from the list or other approved species, for a total of six (6) species. | | | | |

The native forb mix shall be seeded at a rate of 65.34 lbs/AC (73.25 kg/ha) and shall include a minimum of two legumes and eight (8) other forbs from Table 6 (open, dry sites) or a minimum of two legumes and five (5) species of forbs from Table 7 (open, wet sites).

**Table 6: Native Forbs: Dry, Open Sites**

| Common Name | Botanical Name | Exposure | Application rates | |
|---|---|---|---|---|
| | | | Lbs/AC | kg/ha |
| Black-Eyed Susan | *Rudbeckia hirta* | Full-pt sun; dappled shade | 2.0 | 2.2 |
| Illinois Bundleflower * | *Desmanthus illinoensis* | Full-pt sun; dappled shade | 15.0 | 16.8 |
| Scarlet Sage | *Salvia coccinea* | Full-pt sun; dappled shade | 8.0 | 9.0 |
| Pink Evening Primrose | *Oenethera speciosa* | Full-pt sun; dappled shade | 1.0 | 1.1 |
| Drummond Phlox | *Phlox Drummondii* | Full-pt sun | 8.0 | 9.0 |
| Plains Coreopsis | *Coreopsis tinctoria* | Full-pt sun | 2.0 | 2.2 |
| Greenthread | *Thelesperma filifolium* | Full sun | 6.0 | 6.7 |
| Purple Prairie Clover * | *Petalostemum purpurea* | Full sun | 4.0 | 4.5 |
| Cutleaf Daisy | *Engelmannia pinnatifida* | Full-pt sun; dappled shade | 18.0 | 20.1 |
| Partridge Pea * | *Cassia fasciculata* | Full-pt sun | 20.0 | 22.4 |
| Indian Blanket | *Gaillardia pulchella* | Full-pt sun | 10.0 | 11.2 |
| Bluebonnet * | *Lupinus texensis* | Full sun | 20.0 | 22.4 |
| Mexican Hat | *Ratibida columnaris* | Full-pt sun | 2.0 | 2.2 |
| Maximilian Sunflower | *Helianthus maximiliani* | Full-pt sun | 5.0 | 5.6 |
| Prairie Coneflower | *Ratibidia columnifera* | Full-pt sun | 2.0 | 2.2 |
| Clasping Coneflower | *Dracopis* | Full-pt sun | 3.0 | 3.4 |

| | | | | |
|---|---|---|---|---|
| | *amplexicaulis* | | | |
| Purple Coneflower | *Echinacea purpurea* | Full-pt sun; dappled shade | 10.0 | 11.2 |
| Lemon Mint | *Monarda citriodora* | Full-pt sun | 3.0 | 3.4 |
| Huisache Daisy | *Amblyolepis setigera* | Full-pt sun | 8.0 | 9.0 |
| Texas Yellow Star | *Lindheimera texana* | Full-pt sun | 12.0 | 13.5 |
| Lanceleaf Coreopsis | *Coreopsis lanceolata* | Full-pt sun; dappled shade | 10.0 | 11.2 |
| Bush Sunflower | *Simsia calva* | Full-pt sun | 3.0 | 3.4 |
| Winecup | *Callirhoe involucrata* | Full-pt sun; dappled shade | 5.0 | 5.6 |
| ***These species must be included in the mix**. | | | | |

| **Table 5: Native Grasses: Wet, Open Sites** | | | | |
|---|---|---|---|---|
| Common Name | Botanical Name | Exposure | Application Rates | |
| | | | Lbs/AC | Kg/ha |
| American Basketflower | *Centaurea americana* | Full sun | 10.0 | 11.2 |
| Antelope Horns | *Asclepias asperula* | Full sun | 7.0-12.0 | 7.8-13.4 |
| Green Antelope Horn | *Asclepias viridis* | Full sun | 7.0-12.0 | 7.8-13.4 |
| Blue Mistflower | *Conoclinium coelestinum* | Full-pt sun | 0.5 | 0.6 |
| Clasping Coneflower | *Dracopsis amplexicaulis* | Full-pt sun | 3.0 | 3.4 |
| Maximilian Sunflower | *Helianthus maximliani* | Full-pt sun | 4.0 | 4.5 |
| Prairie Blazing Star | *Liatris pycnostachya* | Full sun | 2.0 | 2.2 |
| Pink Evening Primrose | *Oenothera speciosa* | Full sun-dappled shade | 1.0 | 1.1 |
| Mexican Hat | *Ratibida columnifera* | Full-pt sun | 2.0 | 2.2 |
| Black-eyed Susan | *Rudbeckia hirta* | Full sun-dappled shade | 2.0 | 2.2 |
| Illinois Bundleflower | *Desmanthus illinoensis* (legume) | Full sun-dappled shade | 15.0 | 16.8 |
| Obedient Plant | *Physostegia virginiana* | Full sun-dappled shade | 4.0 | 4.5 |
| Partridge Pea * | *Camaecrista fasciculate* (legume) | Full-pt sun | 20.0 | 22.4 |
| Purple Prairie Clover | *Dalea purpurea* var *purpurea* (legume) | Full sun | 4.0 | 4.5 |
| Pitcher Sage | *Salvia azurea* | Full-pt sun | 3.0 | 3.4 |
| Showy Tick Trefoil | *Desmodium canadense* | Full sun | 0.5 | 0.6 |
| Winecup * | *Callirhoe involucrata* | Full- pt sun | 5.0 | 5.6 |
| ***This species must be included in the mix.** | | | | |

**Table 8: Cool Season Cover Crop**

| Common Name | Botanical Name | Exposure | Application rates | |
|---|---|---|---|---|
| | | | Lbs/AC | Kg/ha |
| Western Wheatgrass | *Pascopyrum smithii* | Full-pt sun; dappled shade | 0.5 | 0.25 |
| Oats | *Avena sativa* | Full sun | 0.5 | 0.25 |
| Cereal Rye Grain | *Secale cereale* | Full sun | 0.5 | 0.25 |

One cover crop species of the listed species is required to be planted between September 15 to March 1. Contractor must ensure that any seed application requiring a cool season cover crop does not utilize annual ryegrass (*Lolium multiflorum*) or perennial ryegrass (*Lolium perenne*). Only cereal rye grain (*Secale cereale*), oats (*Avena sativa*) and western wheatgrass (*Pascopyrum smithii*) are approved as cool season cover crop.

Species substitution as necessary due to availability shall be approved by the Landscape Architect, Engineer or designated representative. Watering and fertilizer application shall follow procedures outlined above or as otherwise specified on the Drawings.

Seed shall be applied by broadcast, hydromulch, blown compost, or drill method and shall be distributed evenly over the topsoil areas. Mulching shall immediately follow seed application for broadcast and hydromulch applications.

**Seed Rate Calculations**

The amount of seed needed to be planted on a project shall be calculated before installation to ensure adequate seed is placed, and provided as a submittal. Table 9 is an example worksheet, followed by an example calculation. Information for calculation can be obtained from seed tags or the supplier.

Table 9. Seed Calculation Worksheet

| Plant Group | Desired Seeding Rate (1bs/AC) | PLS (pure live seed) | Bulk Rate (lbs/AC) | Seeding Area (AC) | Amt. of Seed to be Installed (lbs) |
|---|---|---|---|---|---|
| Grasses | | | | | |
| Forbs | | | | | |
| TOTAL | | | | | |

FORMULAS:

PLS (pure live seed) = (Purity x Germination) x 100. Can also use average PLS from seed tags.

Bulk Rate (lbs/AC) =Desired Seed Rate (lbs/AC)/PLS

Amt. of Seed to be Installed (lbs) = Bulk Rate (lbs/AC) x Seeding Area (AC)

Example:

| Plant Group | Desired Seeding Rate (1bs/AC) | PLS (pure live seed) | Bulk Rate (lbs/AC) | Seeding Area (AC) | Amt. of Seed to be Installed (lbs) |
|---|---|---|---|---|---|
| Grasses | 131.00 | 0.81 | 161.73 | 1.50* | 242.60 |
| Forbs | 65.34 | 0.87 | 75.10 | 1.50* | 112.70 |
| TOTAL | 196.34 | 0.84 (ave.) | 236.83 | 1.50 | 355.30 |

*applied over the same 1.5 AC area

### 604S.7 Mulch

Mulches may be used to help prevent soil erosion until final stabilization is achieved. Mulch shall be used to cover broadcasted seeds, especially in sunny, open areas, to protect them from drying out during germination.

A. Straw Mulch.

Straw mulch shall be spread uniformly over the area indicated or as designated by the Engineer or designated representative at the rate of 2 to 2 1/2 tons of straw per acre (4.5 to 5.6 megagrams of straw per hectare). The actual rate of application will be designated by the Landscape Architect, Engineer or designated representative. Straw may be hand or machine placed and adequately secured.

B. Hydromulch

Refer to ECM Section 1.4.7 for hydromulching applications.

C. Shredded Brush Mulch.

Small brush or tree limbs, which have been shredded, may be used for mulching Native Grass seeding.

### 604S.8 Measurement

Weeds (see Table 3) shall be controlled in the most efficient manner possible. Management of weed species should begin early in the project, before seeding for permanent control, and extend into plant establishment, especially for perennial weeds. Manual removal or application of an appropriate herbicide may be required after the initial seeding if emergence of an annual weed species threatens establishment of

sufficient preferred plant cover. Disturbance due to weed management after the initial seeding may necessitate re-seeding of the area to establish sufficient preferred plant coverage. Care should be taken to temporarily stabilize areas where physical removal of weeds has been performed to prevent erosion and sediment runoff.

The entire root system of perennial weeds shall be removed to prevent re-sprouting. Weeds may be controlled with an approved contact, systemic herbicide, provided the product is used with appropriate care and is applied in accordance with label instructions and the following guidelines:

1. Herbicide shall not be applied when the wind is greater than 8 mph (12.9 kph),

2. Herbicide shall not be applied when rainfall is expected within 24 hours,

3. Herbicide shall not contact surface water, i.e. creeks, rivers, and lakes,

4. Herbicide shall not contact desirable vegetation (a wicking method shall be used, if necessary, to accurately contact target weed only during application).

The Landscape Architect, Engineer or designated representative shall be consulted to determine appropriate weed control management when weeds are located in an environmentally sensitive location (e.g. near water or adjacent to a critical environmental feature).

### 604S.9 Measurement

Work and acceptable material for "Seeding for Erosion Control" will be measured by the square yard (meter: 1 meter equals 1.196 square yards) or by the acre (hectare: 1 hectare equals 2.471 acres), complete in place, with a minimum of 95 percent total coverage for the non-native mix, and 95 percent coverage for the native mix. Bare areas shall not exceed 16 square feet (1.5 square meters), and the average height of vegetation shall stand at a minimum of 1 1/2 inch (40 millimeters). Ninety (90) percent of the revegetated area must be free of weeds listed in Table 3. Bare areas greater than 16 s.f. shall be re-prepared and reseeded as required to develop an acceptable stand of plant material.

### 604S.10 Payment

The work performed and materials furnished and measured will be paid for at the unit bid price for "Seeding for Erosion Control" of the method specified on the Drawings and type of mulch. The unit bid price shall include full compensation for furnishing all materials, including all topsoil, water, seed, tackifier, fertilizer or mulch and for performing all operations necessary to complete the work.

All fertilizer will be measured and paid for conforming to Item No. 606S, "Fertilizer".

Payment will be made under one of the following:

| | | |
|---|---|---|
| Pay Item No. 604S-A: | Non-Native Seeding for Erosion Control | Per Square |

| | | |
|---|---|---|
| | Method, _____ Hydraulic Planting | Yard |
| Pay Item No. 604S-B: | Non-Native Seeding for Erosion Control, Broadcast Seeding | Per Square Yard |
| Pay Item No. 604S-C: | Non-Native Seeding for Erosion Control Method, _____ Hydraulic Planting | Per Acre |
| Pay Item No. 604S-D: | Native Seeding for Erosion Control Method, _____ Hydraulic Planting | Per Square Yard |
| Pay Item No. 604S-E: | Native Seeding for Erosion Control, Broadcast Seeding, | Per Square Yard |
| Pay Item No. 604S-F: | Native Seeding for Erosion Control Method, _____ Hydraulic Planting | Per Acre |
| Pay Item No. 604S-G: | Mulch, _____ | Per Square Yard |
| Pay Item No. 604S-H: | Mulch, _____ | Per Acre |
| Pay Item No. 604S-I: | Topsoil and Seedbed Preparation, | Per Square Yard |
| Pay Item No. 604S-J: | Topsoil and Seedbed Preparation, | Per Acre |
| Pay Item No. 604S-K: | Watering, | Per 1000 gal (Kgal) |
| Pay Item No. 604S-L: | Management Practices, | Per Square Yard |
| Pay Item No. 604S-M: | Management Practices, | Per Acre |

**End**

| ***SPECIFIC*** CROSS REFERENCE MATERIALS |
|---|
| Specification Item 604S "Seeding for Erosion Control" |

City of Austin Technical Specifications

| Designation | Description |
|---|---|
| Item No. 130S | Borrow |
| Item No. 601S | Salvaging and Placing Topsoil |
| Item No. 606S | Fertilizer |

City of Austin Land Development Code

| Designation | Description |
|---|---|
| Section 6-4 | Water Conservation |

| ***RELATED*** CROSS REFERENCE MATERIALS |
|---|
| Specification Item 604S "Seeding for Erosion Control" |

City of Austin Technical Specifications

| Designation | Description |
|---|---|
| Item No. 601S | Salvaging and Placing Topsoil |
| Item No. 602S | Sodding for Erosion Control |
| Item No. 605S | Soil Retention Blanket |
| Item No. 607S | Slope Stabilization |
| Item No. 608S | Planting |

City of Austin Standards (Details)

| Designation | Description |
|---|---|
| 627S-1 | Grass Lined Swale |
| 633S-1 | Landgrading |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item No. 160 | Topsoil |
| Item No. 162 | Sodding for Erosion Control |
| Item No. 164 | Seeding for Erosion Control |
| Item No. 166 | Fertilizer |
| Item No. 168 | Vegetative Watering |
| Item No. 169 | Soil Retention Blanket |
| Item No. 180 | Wildflower Seeding |
| Item No. 192 | Landscape Planting |

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**Item No. 606S**
**Fertilizer**

## 606S.1 Description

This item shall govern the provision and distribution of fertilizer over the areas indicated on the Drawings and in accordance with these specifications.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text, inch-pound units are given preference with SI units shown within parentheses.

## 606S.2 Submittals

The submittal requirements for this specification item shall include:

A. Type of soil(s) at the site.
B. Type(s) of re-vegetation (seeding, sodding, etc).
C. Type(s) of fertilizer.
D. Rate(s) of application of fertilizer.
E. Chemical analysis of the fertilizer(s).

## 606S.3 Materials

All fertilizer used on site shall be delivered in bags or containers, which are clearly labeled and show the analysis. The figures in the analysis shall represent the percent of nitrogen, phosphoric acid and potash nutrients, respectively, as determined by the methods of the Association of Official Agricultural Chemists. The fertilizer may be subject to testing by the State Chemist in accordance with the Texas Fertilizer Law. A pelleted or granulated fertilizer shall be used.. Fifty percent or greater of the Nitrogen required shall be in the form of Nitrate Nitrogen ($N0_3$). The remaining Nitrogen required may be in the form of Urea Nitrogen [$CO(NH_2)_2$].

The total amount of nutrients furnished and applied per acre (hectare: 1 hectare equals 2.471 acres) shall equal or exceed that specified for each nutrient.

## 606S.4 Construction Methods

General requirements and criterion for vegetative activities, including fertilizing, for the City of Austin are presented in Section 1.4.4, "Vegetative Practice", and Section 1.5.4, "Revegetation Criteria" of the City of Austin Environmental Criteria Manual.

The fertilizer type and rate of application should be based on chemical tests of representative soil samples taken after completion of construction and ground work. Appropriate initial fertilizer application rates for the Austin area (in lieu of recommendations from soil testing) are provided in the sections of the City of Austin Environmental Criteria Manual identified below:

A. Permanent seeding. - [Section 1.4.4.B.4].
B. Restoring Climax Grasses - [Section 1.5.5.E].
C. Sod. -. [Section 1.4.4.E.5].
D. Maintenance of Mulch Sod. - [Section 1.4.4.C.4].

Pelleted or granulated fertilizer shall be applied uniformly into the soil to a depth of 4 inches (100 mm) over the area specified on the Drawings to be fertilized and in the manner directed for the particular item of work. The fertilizer shall be dry and in good physical condition. Fertilizer that is powdered or caked will be rejected. Distribution of the fertilizer for the particular item of work shall meet the approval of the Engineer or Designated Representative.

Maintenance fertilizing shall be applied every 6 months after the new sod or grass is placed or until the work is accepted by the City.

The fertilizer may also be applied with the hydromulch

### 606S.5 Measurement

Work and acceptable material for "Fertilizer" will be measured by the normal ton of 2,000 pounds (megagrams: 1 megagram equals 1.1023 tons) or by the 100 pounds (50 kilograms: 1 kilogram equals 2.205 pounds) as determined by approved scales or guaranteed weight of sacks shown by the manufacturer.

### 606S.6 Payment

The work performed and materials furnished and measured as provided under "Measurement" shall be included in the unit price bid for the item of construction in which fertilizer is used, unless specified in the Drawings as a Pay Item.

When fertilizer is specified on the Drawings as a pay item or included in the contract bid form, the work performed and materials furnished and measured as provided under "Measurement" will be paid for at the unit bid price for "Fertilizer" of the analysis specified on the Drawings. The unit bid price shall include full compensation for furnishing all materials and performing all operations necessary to complete the work.

Payment, when specified, will be made under one of the following:

| | | |
|---|---|---|
| **Pay Item No. 606S-A**: | Fertilizer | Per Ton. |
| **Pay Item No. 606S-B**: | Fertilizer | Per 100 Pounds. |

**End**

| **SPECIFIC** CROSS REFERENCE MATERIALS |
|---|
| Specification Item 606S "Fertilizer" |

City of Austin Environmental Criteria Manual

| Designation | Description |
|---|---|
| Section 1.4.4.B.4 | Design Criteria of Section B. Critical Area Stabilization (with Permanent Seeding) |
| Section 1.4.4.C.4 | Design Criteria of Section C. Critical Area Stabilization (with Mulch Sod) |
| Section 1.4.4.E.5 | Site Preparation of Section E. Critical Area Stabilization (with Sod) |
| Section 1.5.5.E | Fertilizer, Section E of 1.5.5, "Restoring Climax Grasses" |

| **RELATED** CROSS REFERENCE MATERIALS |
| --- |
| Specification Item 606S "Fertilizer" |

City of Austin Technical Specifications

| Designation | Description |
| --- | --- |
| Item No. 601S | Salvaging and Placing Topsoil |
| Item No. 602S | Sodding for Erosion Control |
| Item No. 604S | Seeding for Erosion Control |
| Item No. 605S | Soil Retention Blanket |
| Item No. 607S | Slope Stabilization |
| Item No. 608S | Planting |
| Item No. 609S | Native Grassland Seeding and Planting for Erosion Control |
| Item No. 610S | Preservation of Trees and Other Vegetation |

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## 608S.1 Description

This item shall govern the provision of the specified plants and other materials, the initial installation of plants and other materials, the maintenance of plantings, transplanting and any replacement of trees, plants and ground cover which are damaged, diseased or otherwise unhealthy during the warranty period 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, the inch-pound units are given preference followed by SI units shown within parentheses.

## 608S.2 Submittals

The submittal requirements for this specification item shall include:

A. A listing of each type of planting (tree, shrubs, plants, etc.), type of stock (containerized, ball and burlapped, bare root, bag grown, etc.), name (common and botanical) and size of planting (root diameter, height and spread);

B. A request, if necessary, for use by Contractor of collected stock on the site;

C. Specific information for each pesticide (including herbicide) associated with the listing including:

manufacturer,
product name,
description of chemical composition,
handling, storage and mixing requirements
application recommendations
documentation of licensed applicator(s), and
MSDS Sheets

D. Type, chemical analysis and rate of application of fertilizer

E. Proposed tree dressing, trunk wrapping and flagging tape;

F. Type, chemical analysis and rate of application of proposed transpirants

G. Documentation of irrigator license, if irrigation is required at the site.

## 608S.3 General

A. Plant Standards

Unless shown otherwise on the Drawings, the following published standards will apply. Standards for nursery stock will be as stated in the "American Standard for Nursery Stock", as published by the American Association of Nurserymen, Incorporated. Botanical names as shown on the Drawings will be as stated in the "Standardized Plant Names" as identified by the American Joint Committee on Horticultural Nomenclature or other referenced text including the "Manual of the

Vascular Plants of Texas for Native Flora". Pruning standards will be as established by the National Arborist Association in the "Pruning Standards for Shade Trees".

B. License Requirements

1. Pesticide.

   The Contractor shall be a licensed pesticide applicator or shall employ a licensed pesticide applicator for the treatment of insects, diseases, animals as required by the Texas Pesticide Laws and Regulations of the Texas Department of Agriculture. The Engineer or designated representative may request documentation of such certification.

2. Herbicide.

   The Contractor shall possess a permit or employ a person who possesses a permit to apply herbicide as required by the Texas Herbicide Law of the Texas Department of Agriculture. The Engineer or designated representative may request documentation of such certification.

3. Irrigation.

   The Contractor shall possess an irrigator's license issued by the State of Texas and the Texas Board of Irrigators or employ such a licensed irrigator to perform the irrigation system maintenance. The irrigation system shall be maintained under the supervision of the licensed irrigator who shall be available on the site as required by the Engineer or designated representative.

The Engineer may request documentation of such license. The Contractor shall verify and adhere to the requirements and codes of any controlling utility authorities.

**608S.4 Materials**

A. Plant Material

Plant material shall be first class grade, true to name and of the size indicated on the Drawings. All plants shall be healthy nursery grown unless otherwise indicated on the Drawings. When the Engineer or designated representative is furnished sufficient evidence that a specified plant cannot practically be obtained, the Engineer or designated representative may approve in writing the use of collected native material.

Nursery grown stock, either in containers or in the field, shall be nursery grown in accordance with accepted horticultural practices and under climatic conditions similar to those of the work site for at least twelve (12) months, unless specifically authorized otherwise by the Engineer or designated representative.

1. Container plants.

   Soil volume for containers shall be three-fourths (3/4) the depth of the container or greater and contain roots of the plants throughout the root ball.

   (a) Containerized Stock.

   This stock will be defined as nursery plant stock transplanted from a growing site with a ball of soil, containing an intact root system, and placed in a container and grown in that container continuously long enough for the new fibrous roots to have developed so that the root mass retains its shape and holds together after removal from the container. Containerized stock shall

have been grown in the delivered containers for at least six (6) months, but not over two (2) years.

(b) Container Grown Stock.

This stock will be defined as nursery plant stock, which has been planted in a container as a liner, seed or by other propagation method, and that:

(1) has been systematically replanted or stepped up in larger containers as required,

(2) has developed a root system in a planting medium capable of sustaining acceptable plant growth, and

(3) has become established in the container and exhibits a well-rooted condition as evidenced by the soil ball remaining intact when removed from its container.

2. Balled and Burlapped Stock.

This stock will be defined as nursery plant stock which has been removed from the growing site with a ball of soil, containing the intact root system, and encased in burlap (or other approved similar material) to hold the soil in place. Ball sizes for balled and burlapped stock shall be as shown on the Drawings.

3. Bare Root Stock.

This stock will be defined as nursery plant stock, which has been removed from the growing site with the root system substantially free of soil. The approved minimum root spread and condition shall be as shown on the Drawings.

4. Collected Stock.

This stock will be defined as nursery plant stock, which has been removed from its original native habitat. All collected stock shall specific approval of the Engineer or designated representative before it can be removed from its existing habitat. Ball sizes for collected stock shall be as shown on the Drawings and shall have sufficient diameter and depth to encompass enough fibrous and feeding root system as necessary for the full recovery of the plant. Collection may be by hand or mechanical method. For balled and burlapped or mechanical transplanting of collected plant material refer to article 608S.5.

5. Bag Grown Stock.

This stock will be defined as nursery plant stock which has been transplanted into a nonwoven fabric container which has been placed in the ground and the plant grown under nursery field conditions continuously long enough [normally one (1) month for each inch (25 mm) of bag diameter i.e., a plant with a 24 inch (600 mm) diameter bag, grown in its original planted location for 24 months] for the fibrous roots to have developed so that the root mass retains its shape and holds together after removal of the bag. The root ball shall be flat bottomed and straight sided. Ball sizes for bag grown stock shall be as shown on the Drawings. Bag grown stock shall not be pruned before delivery.

6. Other Plant Materials.

Other plant materials shall be as shown on the Drawings.

B. Rejection of Plants.

Plant material having any of the following features will be subject to rejection:

1. Undue or excessive abrasions of the bark.
2. Dried or damaged root system.
3. Dried or damaged top wood of deciduous plants or dried or damaged foliage and top woods of evergreens.
4. Prematurely opened or damaged buds or buds stripped off.
5. Disease or insect infestation, including eggs or larvae.
6. Dry, loose, cracked, broken and/or undersized balls or containers, which do not conform to sizes indicated on the Drawings.
7. Evidence of heating, molding, wind burn, sunscald, freezing, etc.
8. Container plants that are overgrown or root bound.
9. Plants with bench balls (roots repacked with soil).
10. Plant balls encased in non-bio-degradeable plastic or other impervious material.
11. Field grown or collected plants transplanted into containers less than six (6) months or more than two (2) years.
12 Trees that have been damaged, pruned, crooked or multiple leaders, unless multiple leaders are specified or are normal for the species.
13. Plants with disfiguring knots or fresh cuts of limbs over 3/4 inch (20 mm) that have not completely callused.
14. Plants that do not posses a normal balance between height and spread for the species.
15. Plant containers that are not structurally sound (tracked, bent, etc.).
16. Plants in containers less than three-fourths (3/4) planting medium depth;
17. Any endangered or threatened plants; or plants of historical significance that have been collected;
18. Any other physical damage or adverse conditions that would prevent thriving growth or cause an unacceptable appearance; or
19. Plants that do not meet the standards shown on the Drawings.

C. Delivery and Receipt of Plants

Material shall not be delivered to the project until ordered to do so in writing by the Engineer or designated representative. When the delivery order is issued, the Engineer or designated representative shall be notified of a proposed delivery of plant material at least 48 hours prior to its arrival at the project. The entire plant shall be properly protected from sun and air damage during the time period from initiation of digging until delivery on the project

Each plant material shipment shall be accompanied by an invoice indicating the number, size and name (common and botanical) of each of the kinds of plant material included in the shipment. Each kind of plant in the shipment shall be adequately identified by tags. All plants shall be individually tagged with nursery name tags designating the genus, species and variety of the plant.

No shipment of plant material shall be accepted, planted and/or heeled-in by the Contractor until such material has been inspected and accepted by the Engineer or designated representative. The Contractor shall assist the Engineer or designated representative in the inspection of material. Any plants rejected shall be immediately removed from the project and replaced.

Unless plants are placed in predug holes and planted as specified herein, they shall be heeled-in and inspected again prior to planting. If delivered to predug planting holes, balled and burlapped plants shall be planted within 1 to 6 hours depending upon the drying effect of the wind and sun. No bare rooted plants shall be placed in predug holes from the delivery truck unless actual planting occurs immediately after removal from its moist packing.

D. Plant Size

Plants will be measured when branches are in their normal position. Height and spread dimensions shown on the Drawings refer to the main body of the plant and not branch tip to tip. Plants with a spreading or semi-spreading habit will be measured by the average diameter of the spread. Plant heights will be measured by the mean height from the ground line to the top of the canopy. Caliper measurements will be taken at a point on the trunk six (6) inches [150 mm] above natural ground for trees up to four (4) inches [100 mm] in caliper and at a point twelve (12) inches [300 mm] above natural ground for trees over four (4) inches [100 mm} in caliper. The caliper size for multi-trunked plants will be determined by adding the calipers of the largest cane and one-half (1/2) the caliper(s) of the second and third largest cane(s).

When a range of size is shown on the Drawings, no plant shall be less than the minimum size and at least 40% of the plants shall be as large as the maximum size shown on the Drawings. The required measurements are the minimum sizes acceptable and are the measurements after pruning, when pruning is required.

Sizes of plants or plant types such as palms, roses, vines, groundcovers, seedings, bulbs, corms, tubers, young plants, understock, etc., will be measured in accordance with the plant standards or as indicated on the Drawings.

Container-grown plants which are well established in adequate size containers and are of equal quality and size to the specified balled plants may be accepted in lieu of balled plants; likewise, balled plants of equal quality and size may be substituted for container-grown plants when permitted by the Engineer or designated representative. Soil shall be approximately 3/4 depth of container and contain roots of the plant throughout the soil.

The ball size for a balled and burlapped plant shall be firm natural balls equal to or in excess of the ball sizes indicated on the Drawings. Collected plant material substituted for a nursery-grown plant shall have a ball or root system 1/4 greater in both diameter and depth than the nursery-grown plant for which it is substituted. The ball size shall be the average of the diameters measured 90 degrees apart.

E. Mulch

Unless indicated otherwise on the Drawings, mulch material shall consist of loose organic residue derived from plants or other granular material approved by the Engineer or designated representative. It shall be of such nature that adequate protection is provided against sun baking and quick drying out of the soil and shall not impede aeration or water penetration nor deplete the soil nitrogen. Mulch material shall be free of excess amounts of large leaves and sticks that would prevent proper dressing of the mulched surface, free of harmful substances and free of detrimental amounts of soil or other foreign matter that would promote early compaction, matting or deterioration of the mulch.

F. Peat Moss

Peat Moss shall be of sphagnum origin of commercial quality.

G. Planting Soil Mixture

The planting soil mixture shall consist of a soil mixture of 3/4 fine sandy loam, 1/8 peat moss and 1/8 leaf mold. The sandy loam shall be taken from a well drained, arable site. It shall be free of subsoil, stones, clay, roots, weeds, grass or other objectionable debris, matter or toxic wastes.

H. Water

Water shall be furnished by the Contractor and shall be clean and free of industrial wastes and other substances harmful to the growth of plants and the areas irrigated.

Availability of water from the Austin Water Utility will be limited as stated under the Water Conservation Standard, City of Austin Land Development Code Chapter 6-2, Article II, "Water Use Management Plan Established".

The use of potable water will be restricted as stated in City of Austin Land Development Code Sections 6-4-73, 6-4-54, 6-4-63, 6-4-64, 6-4-65, 6-4-81, 6-4-92, 15-9-37(D) and 15-9-101(B).

I. Fertilizer

Fertilizer shall be applied uniformly conforming to City of Austin Standard Specification tem No. 606S, "Fertilizer" at the rate indicated.

J. Pesticides including Herbicides

Pesticides including herbicides shall be of the types that are commercially available selected for the species planted or as indicated on the Drawings and shall be applied in accordance with the manufacturer's recommendations upon approval of the Engineer or designated representative.

K. Stakes and Guys

Stakes shall be 2 x 2 x 18 inch (50 x 50 x 450 mm) sound hardwood or treated pine with tapered point and chamfered tops. Guys wires shall be 2 strand 12 ga. (2.7 mm) galvanized steel wire with 1/2 inch (12.5 mm) diameter reinforced plastic or rubber hose trunk bushings and yellow plastic flagging.

L. Bracing

Bracing shall be 2 x 4 inch (50x100 mm) hardwood or metal fence posts, 6 ft. (1.8 meters) in length with guys and bushings.

M. Flagging Tape

Flagging tape shall be highly reflective, visible at night, and approved by the Engineer or designated representative.

N. Trunk Wrapping

Trunk wrapping shall be 4 inch (100 mm) wide commercial trees wrapping paper with asphalt core or the type shown on the Drawings.

O. Anti-transpirants

Anti-transpirants, intended to prevent evaporation, shall be of the types that are commercially available and approved by the Engineer or designated representative.

**608S.5 Construction Methods**

Immediately following delivery and acceptance at the job, all plants shall be planted or heeled-in in properly moistened material. All plants heeled-in shall be properly maintained by the Contractor until planted. The utmost care shall be exercised in handling plants to prevent injuries to the plants. The solidity of the ball or balled and burlapped plants shall be carefully preserved and such plants shall not be handled by the stems.

Plants with exposed roots shall be protected from drying out during the time the plants are removed from the heeling-in bed and until actually planted.

A. Staking of Planting Locations.

All locations of trees, shrubs and beds shall be staked in the field by the Contractor. All locations will be approved by the Engineer or designated representative prior to any excavation of plant beds or bed preparation. Stakes shall be placed and coded to denote the type of plant material.

B. Excavation of Planting Pits

1. General.

The Contractor shall not excavate plant pits more than 24 hours in advance of planting operations. Any plant pits left unattended for any length of time which may present a hazard shall be covered and/or clearly flagged as approved by the Engineer or designated representative. The walls and bottoms of all plant pits shall be scarified immediately prior to the placement of plants.

2 Pit Sizes.

Planting holes may be dug by hand or by mechanical means and shall be circular or square (according to the shape of the root ball) with vertical sides, unless otherwise indicated on the Drawings. Trimming of the sides or bottom of the hole to uniform shape will not be required. Planting pit sizes shall be as follows, unless indicated otherwise on the Drawings:

(a) A minimum horizontal dimension of twelve (12) inches [300 mm] between the root ball and the sides of the planting pit for the following plant specifications:

(1) Containers of fifteen (15) gallons or larger [56 liters or larger],

(2) Boxes of fourteen (14) inches or larger [350 mm or larger] and

(3) Root ball diameter of Balled and burlapped or bag grown plants larger than fourteen (14) inches [350 mm].

(b) A minimum horizontal dimension of two (2) times the diameter of the root ball for the following plant specifications:

(1) Containers less than fifteen (15) gallons [less than 56 liters]

(2) Root ball diameter of Balled and burlapped or bag grown plants fourteen (14) inches or less [350 mm or less]

(c) A minimum diameter for bare-root plants to permit the roots to spread without crowding or curving around the walls of the pit.

(d) Planting pits shall be excavated to a depth of at least 4 inches (100 mm) but not more than 8 inches (200 mm) greater than the depth of the root ball of balled and burlapped, containerized, container grown or bag grown plants; or the depth of the root system of bare-root plants. Pits dug to excess depths shall be backfilled and compacted to bring the pits to the specified depth. The depth of pits on slopes shall be measured at the lower side.

(e) When performing mechanical transplanting, the receiving plant pit shall be excavated with the same type of equipment used to remove the plant material or as approved by the Engineer or designated representative.

(f) Special sized holes shall be shown on Drawings.

(g) Where holes are dug with an augur and the sides of the holes become plastered or glazed, this plastered or glazed surface shall be scarified.

C. Planting Season

All planting shall be performed as shown below, indicated on the Drawings or as approved by the Engineer or designated representative.

| Planting Stock | Planting dates |
|---|---|
| Containerized or Container grown | None specified |
| Balled and burlapped | November 15 to March 15 |
| Bare root | January 15 to March 15 |
| Bag grown | September 15 to April 15 |
| Collected | As shown on the Drawings or as approved by the Engineer or designated representative |

D. Backfilling

Topsoil from the planting hole may be used for backfilling provided it is kept separate from subsoil and rendered loose and friable. Additional topsoil required to backfill the holes shall be furnished in the amount directed in Subarticle 608S.4.G, 'Planting Soil Mixture' and from a source approved by the Engineer or designated representative.

E. Pruning Roots

Root pruning shall be limited to the amount necessary to prune away broken and badly damaged roots.

F. Pruning of Tops

Pruning of plants shall conform to the best horticultural practice and shall be appropriate to the various types of plants and the special requirements of each. Deciduous (non-evergreen) shrubs and trees with heavy tops shall have about 1/3 to 1/2 of the top growth removed. Plants otherwise acceptable, but with broken or badly bruised branches, shall have such branches removed with a clean cut. All cut surfaces over 1 inch (25 mm) in diameter shall be painted with an approved tree pruning compound.

G. Planting and Backfilling

In general the top of root ball shall stand after settlement of the backfill approximately level with the finish grade. When shown on the Drawings, fertilizer of the type and quantity specified shall be added on the backfill material prior to backfilling. Unless indicated otherwise on the Drawings or approved otherwise by the Engineer or designated representative, planting and backfilling shall be as follows:

1. Plant Basin

A basin, 8 to 10 inches (200 to 250 mm) deep, shall be formed by constructing a neat levee around the planting pit. The inside measurement of the basin shall be

at least the diameter of the growing plant, unless noted otherwise on the Drawings. On slopes the backfill on the lower side shall be graded in such a manner that an adequate basin will be provided.

As shown on the Drawings, either material excavated from the planting pit (excluding any rocks) or Backfill, as specified in Subarticle 608S.5.D may be used to form a basin around the plant. Excess excavated material may be scattered thinly and leveled off provided it is of such consistency and character that it can be readily scattered in an acceptable manner. If scattering of the material may interfere with drainage or mowing, all such material shall be removed and disposed of as approved by the Engineer or designated representative.

2. Depth of Transplanting

In general, plants shall be installed and covered with top soil approximately one (1) inch (25 mm) above the top of the root ball or container soil surface.

3. Bare Root Plants

After the backfill in the bottom of the planting pit has been firmed and the plant placed in the proper position, as shown on the Drawings, loose friable backfill (Subarticle 608S.5.D) or planting soil mixture (608S.4.G) shall be worked about the roots and thoroughly settled with water as the backfill is made. Care shall be taken to avoid bruising or breaking the roots. Sticks, sod, clods or other material which may form large air pockets in the soil or backfill shall not be included in the backfill.

4. Balled and Burlapped Plants

Plants of this type shall not be handled by the stems nor in such manner that the soil of the ball may be loosened. A saddle around the ball should be used for lifting. The burlap shall not be removed from the ball. After the backfill in the bottom of the pit has been firmed and the plant placed in the proper position, as shown on the Drawings, loose friable backfill shall be worked about the ball in 12 inch (300 mm) until the pit is two-thirds (2/3 full). The burlap shall then be opened on top of the root ball to expose the top one-third (1/3) of the root ball. The pit shall then be filled with water and the backfilling completed, working the backfill and water well to prevent any air pockets.

For ball supporting devices such as wire baskets, the basket shall not be removed. The plant shall be placed in the prepared planting pit in the proper position and backfill shall be placed around the ball until the pit is about one-third (1/3) full. The basket shall be carefully removed to just above the backfill, leaving the bottom portion intact. Backfilling shall be completed as described above.

5. Containerized or Container Grown Plants

At the time of planting the root ball and plant shall be carefully removed from the container to prevent damage to the plant and root ball. If in the opinion of the Engineer or designated representative a sufficient amount of soil has fallen off or the ball has been broken to such an extent as to reduce the chances of the plant to grow, the plant will be rejected. Container plants shall be acclimated to outside growing conditions. Container plants shall be placed and backfilled in the same manner as balled and burlapped plants.

6. Bag Grown Plants

Prior to planting, the fabric bag shall be removed by using a knife to cut the side of the bag from top to bottom in three or four places of equidistant around the root

ball. The bag shall be carefully peeled down and roots that do not easily peel away from the bag shall be pruned. The plastic bag shall then be pulled from under the root ball. Bag grown plants shall be placed and backfilled in the same manner as balled and burlapped plants.

H. Vegetative Watering

During the planting operations, the Contractor shall keep the ground and backfill material moist to at least 12 inches (300 mm) around the root ball. The Contractor shall be required to meet the minimum watering requirements shown on the Drawings for all circumstances by a method approved by the Engineer or designated representative. When an irrigation system is shown on the Drawings, the Contractor shall coordinate all work to insure that the irrigation system is operational as the plants are installed.

I. Anti-transpirants

When shown on the Drawings, the Contractor shall apply anti-transpirants in accordance with the manufacturer's recommendations and as approved by the Engineer or designated representative.

J. Pruning

Plants shall not be pruned immediately before delivery to the work site, unless shown otherwise on the Drawings or as approved by the Engineer or designated representative. Common nursery pruning practices are acceptable. Any necessary pruning shall be done at the time of planting as approved by the Engineer or designated representative and shall be appropriate to the various types of plants and the special requirements of each.

From 20 to 40 percent of all foliage of mechanically transplanted plants shall be removed by pruning interior branching, entangled limbs and small branches. Structural branching shall not be removed prior to planting. Branch tips shall not be removed to attain the above percentage.

K. Plant Supports and Bracing Trees

Plant supports such as staking, guying and bracing shall be as shown on the Drawings or as required by the Engineer or designated representative.

Trees shall be staked, guyed or braced for support during the same day as planted. Unless shown otherwise on the Drawings, the plants shall stand approximately vertical after staking, guying or bracing. The Contractor shall be responsible for material remaining approximately vertical and straight for all given conditions and shall repair plant supports as often as required until final acceptance of the work.

All trees 1 1/4 inches (38 mm) and greater in caliper shall be adequately braced immediately after the plants have settled. Unless otherwise indicated on the Drawings, trees 1 1/4 to 2 inches (38 to 50 mm) in diameter shall be braced with 1 brace of sawed lumber, 2 x 2 inches (50 x 50 mm), nominal size, firmly fastened to the tree at a point 5 to 6 feet (1.5 to 1.8 meters) above ground or as directed by the Engineer or designated representative. Fastening shall not be accomplished by nails, staples, wire or other materials that may damage tree. Braces shall be of sufficient length to provide bracing when firmly driven into the ground. The tree trunk shall be adequately padded with a section of flexible hose at the point of attachment with a figure 8 tie. Trees, that are 2 inches to 4 inches (50 to 100 mm) in diameter, shall be

braced with wires at a height of 6 to 8 feet (1.8 to 2.4 meters) above ground. The wires shall be firmly attached to 3 equally spaced concentric stakes that are firmly driven into the ground. The trunk of the tree shall be adequately and securely padded with rubber at the point of attachment of the wire to prevent damage. Wire shall be number 16 gauge (1.5 mm) galvanized.

Trees larger than 4 inches (100 mm) in diameter shall be braced in accordance with notes on Drawings. The Contractor shall repair braces as often as required until acceptance of the project for "Plant Establishment".

L. Safety Flagging Tape

Staking, guying or bracing, which present a hazard shall be clearly flagged as shown on the Drawings or directed by the Engineer or designate representative.

M. Tree Trunk Protection

All trees indicated on the Drawings to be wrapped shall be neatly and securely wrapped with a commercial tree wrapping material approved by the Engineer or designated representative. The tree wrapping shall begin at the base of the trunk and extend upward with a 50 percent overlap to the second whorl of branches. The tree wrapping material shall be secured at the top of wrap with soft twine or weatherproof type tape or any suitable method, approved by the Engineer or designated representative. Wire, metal bands or other material for this purpose that may cause injury or damage to plants shall not be used.

N. Mulching

All plants shall receive mulching to a depth of 2 to 3 inches (50 to 75 mm) within the water basin or across the beds unless indicated otherwise on the Drawings. A small amount of backfill shall be sprinkled on top of organic mulch to hold it in place if directed by the Engineer or designated representative. If hay is used, the depth shall be 4 inches (100 mm) loose measurement.

O. Plant Material Removal and Replacement

A plant shall be removed and replaced as directed by the Engineer or designated representative at any time during execution of the work under this Item including the Establishment Period if, in the judgement of the Engineer or designated representative, a plant is found to be in any of the following conditions:

1. Dead;
2. Dying;
3. Wilted for 48 hours or more; or
4. Any other signs of detrimental consequence.

All replacement plants shall be the same species, size and quality as originally specified. The Contractor shall make every effort to ensure that the replacement material receives any additional care and maintenance required for the replacement plants to become well established. The Engineer will require replacement of plant material until satisfied that all of the plants on the work are in a healthy, vigorous condition.

P. Maintenance and Initial Plant Replacement

The Contractor shall water the plants as often as necessary, cut the weeds and grass around the planted area including the plant basin and bracing, prune the plants, treat the plants in accordance with approved methods of horticultural practice where

insects or disease affect the plants after planting and repair or replace the bracing as may be required or as ordered by the Engineer or designated representative until the planting project has been accepted for "Plant Establishment".

If the Contractor completes the initial planting prior to March 1 for balled and burlapped and bare root plants or April 1 for bag grown plants, the Contractor will be required to replant all material found to be missing, damaged or dead during this time. This replanting shall be done between March 1 and March 15 for balled and burlapped and bare root plants, between April 1 and April 15 for bag grown plants or as directed by the Engineer or designated representative.

In the event that the planting project is not completed by March 15 for balled and burlapped and bare root plants, or by April 15 for bag grown plants and no further planting is permitted until the following "Planting Season", the partial planting will be cared for as prescribed under "Plant Establishment".

### 608S.6 Plant Establishment

"Plant Establishment" shall commence with the notice of substantial completion and shall extend to the following November 15 for those plantings that are completed in accordance with Subarticle 608S.5.P, ' Maintenance and Initial Plant Replacement'. In those instances where planting 'out of season' is allowed in writing by the Engineer or designated representative, "Plant Establishment" shall commence with notice of substantial completion and shall extend for a minimum of six (6) months or to the following November 15, which ever results in a later date.

For the work of "Plant Establishment", all possible means shall be employed to preserve the plants in a healthy and vigorous growing condition to insure their successful establishment. The Contractor shall perform all of the activities listed below during placement of all the plants. After the completion of the installation, as shown on the Drawings and as approved by the Engineer or designated representative, the Contractor shall perform the following activities for a period of 90 calendar days:

A. Mulching, Plant Basin and Bed Maintenance

The Contractor shall reshape or reform the existing plant basins and beds as necessary to conform to the Drawings, and as approved by the Engineer or designated representative. As a part of the plant basin and bed maintenance, weeds and grass shall be removed prior to the application of mulch. Unless otherwise shown the Drawings, the mulch shall be maintained to a minimum depth of 2 to 3 inches (50 to 75 mm).

The Contractor shall maintain the plant basins, beds and site fixtures generally free of weeds and grass or other materials detrimental to the growth of the plants or the appearance of the site. Herbicides, if approved by the Engineer or designated representative and used by the Contractor, shall be limited to the plant basin and perimeter thereof or around site fixtures as approved by the Engineer or designated representative. Extreme care shall be taken to insure that the herbicide does not come into contact with any part of the desirable plants. Under no circumstances shall the herbicide be used on days where the wind could cause drift hazard to desirable plants. The Contractor shall also follow the manufacturer's instruction for the use and application of any herbicide.

B. Plant Irrigation

The Contractor shall be required to meet the minimum watering requirements for all circumstances by a method approved by the Engineer or designated representative as stated under Subarticle 608S.5.H and/or as shown on the Drawings.

Watering equipment other than an existing irrigation system shall have adequate and accurate measuring devices as approved by the Engineer or designated representative.

C. Mowing and Trimming

The Contractor shall mow and trim the areas identified on the Drawings. The work shall be performed at the frequency as shown on the Drawings. The initial cycle shall begin when directed by the Engineer or designated representative. Mowing heights shall be as shown on the Drawings or approved by the Engineer or designated representative.

The Contractor shall use power equipment as approved by the Engineer or designated representative. Nylon cord trimmers shall not be used inside the plant basins or beds around plant material.

D. Restaking, Reguying and Rebracing of Plants.

Any damaged or destroyed stakes, guys or braces shall be replaced by the Contractor in accordance with the details shown on the Drawings. This shall include any adjustment to the staking or guying to prevent girdling of plants.

E. Pruning

When directed by the Engineer or designated representative or shown on the Drawings, plants shall be pruned by the Contractor to the satisfaction of the Engineer or designated representative. Dead or damaged limbs on trees and shrubs, including suckergrowth on trunks of trees, shall be removed. All pruning shall be accomplished with tools specifically designed for this purpose. All pruned material shall become the property of the Contractor and shall be disposed of in a manner approved by the Engineer or designated representative.

F. Insect, Disease and Animal Control

The Contractor shall treat the plants and/or the planted areas in accordance with accepted methods of horticultural practices and the Texas Department of Agriculture guidelines regarding the use of pesticides. The Contractor shall also follow the manufacturer's instructions for the use and application of any pesticides.

G. Litter Pick-Up

Unless shown otherwise on the Drawings, the Contractor shall collect and dispose of all litter within the landscaped areas. The work shall be performed at the frequency shown on the Drawings or as directed by the Engineer or designated representative.

All litter shall become the property of the Contractor and shall be disposed of in a manner acceptable to the Engineer or designated representative.

H. Fertilization

During the 90-day establishment period, the Contractor shall furnish and apply fertilizer only to those plants as shown on the Drawings. The analysis, times and rates of application shall be as shown on the Drawings. The type of fertilizer and method of application shall be as shown on the Drawings or as approved by the Engineer or designated representative.

I. Plant Removal

In the judgement of the Engineer or designated representative, any plant that is dead or dying for reasons beyond the control of the Contractor and is not to be replaced shall be removed by the Contractor to the satisfaction of the Engineer or designated representative. This shall include repair of the plant pit and the surrounding area.

**608S.7 Acceptability of Plants**

Between 90 to 100 days following the initial planting and initial plant replacement, the Engineer or designated representative will make an inspection of the project to determine the acceptability of the plant material. At this time, an inventory of missing, dead or rejected plant material will be made and the Contractor notified that the plants on the inventory are to be replanted the following planting season between November 15 and December 15 or as specifically permitted by the Engineer or designated representative. Plant material for the replacement planting shall meet all the requirements specified for the original plant material and shall be planted in accordance with the planting instructions listed under "Construction Methods", except that no further plant replacement will be required. Working days stated in the Contract shall apply to the initial construction period only and will not include the time necessary for replanting. A final inspection shall be made within 10 days after the replacement planting is completed.

**608S.8 Measurement**

Work and accepted material as prescribed for this item including "Plant Establishment" will be measured as each plant of the type and size complete and in place.

**608S.9 Payment**

Work performed and accepted material as prescribed by this item, measured as provided under “Measurement", will be paid for at the unit bid price bid for each plant of the type and size specified, complete and in place. The unit bid price shall include full compensation for furnishing all labor, pruning, mowing, insect control, disease control, animal control, watering, fertilizing, herbiciding, litter pickup, maintenance, tools, equipment, materials, supplies and incidentals necessary to complete the work.

Payment will be made under:

| | | |
|---|---|---|
| **Pay Item No. 608S-1**: | Planting Type ___, Size in inches____ | Per Each. |
| **Pay Item No. 608S-2**: | Irrigation System | Lump Sum |

**End**

**SPECIFIC** CROSS REFERENCE MATERIALS

*City of Austin Standard Specifications*

| *Designation* | *Description* |
|---|---|
| Item No. 606S | Fertilizer |

*City of Austin Land Development Code*

| *Designation* | *Description* |
|---|---|
| Section 6-4-52 | Water Use Management Plan Established |
| Section 6-4-53 | Applicability |
| Section 6-4-54 | Compliance Required |
| Section 6-4-63 | Permanent Water Use Restrictions |
| Section 6-4-64 | Water Conservation Stage One Regulations |
| Section 6-4-65 | Water Conservation Stage Two Regulations |
| Section 6-4-81 | Variance |
| Section 6-4-92 | Penalty |
| Section 15-9-37(D) | Customer's Responsibilities |
| Section 15-9-101(B) | Basis for Termination of Service |

**RELATED** CROSS REFERENCE MATERIALS

*City of Austin Environmental Criteria Manual*

| *Designation* | *Description* |
|---|---|
| Section 1 | Water Quality Management |
| Section 1.4.4 | Vegetative Practices |
| Section 1.5.0 | Vegetation Criteria |
| Section 1.5.3 | Impact Minimization and Restoration Planning |
| Section 1.5.3.D.6 | Discussion-Plant Protection |
| Section 1.5.3.D.8 | Salvaging Trees and Shrubs |
| Section 1.5.3.D.9 | Transplanting Procedure |
| Section 2 | Landscape |
| Section 2.4.1 | Street Yard |
| Section 2.4 1.D | Street Yard Trees |
| Section 2.4 6 | Irrigation of Landscape Areas |
| Section 2.4 6.A.1 | 'Owner responsibility for irrigation .....' |
| Section 2.7.0 | Hill Country Roadway Landscape Criteria |
| Section 2.7.2 | Design Criteria |
| Section 2.7.2.G | Irrigation |
| Section 3 | Tree and Natural Area Preservation |
| Section 3.3.2 | General Tree Survey Standards |
| Section 3.3.2.A.1 | Diameter |
| Section 3.5.4.A.6 | Mitigation Measures-Enforcement Criteria |
| Section 3.5.0 | Design Criteria |
| Section 3.5.4 | Mitigative Measures |
| Section 3.5.4.E | Transplanting |
| Section 5 | Construction in Parks |
| Section 5.3.0 | Route Selection |
| Section 5.3.1 | Tree Survey |
| Appendix K | Arboricultural Practices - Parks |
| Appendix K, I | Tree Protection |
| Appendix K, II | Treatment of Minor Wounds or Breakage |
| Appendix N | Professional Plant List |
| Appendix O | Site Development Permit-Irrigation Notes |
| Appendix P-2 | Standard Notes for Trees and Natural Area Protection |
| Figure 1-27 | Grasses |
| Figure 1-33 | Rare Plants in the Austin Area |

*City of Austin Transportation Criteria Manual*

| *Designation* | *Description* |
|---|---|
| Section 1.4.3 | Classification Design Criteria- |
| Section 6.2.3 | Transportation Criteria for Landscaping |

*City of Austin Standard Specifications*

| *Designation* | *Description* |
|---|---|
| Item No. 101S | Preparing Right of Way |
| Item No. 111S | Excavation |
| Item No. 601S | Salvaging and Placing Topsoil |

*Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges*

| *Designation* | *Description* |
|---|---|
| Item No. 100 | Preparing Right of Way |
| Item No. 110 | Excavation |
| Item No. 160 | Furnishing and Placing Topsoil |
| Item No. 166 | Fertilizer |
| Item No. 168 | Vegetative Watering |
| Item No. 170 | Irrigation System |
| Item No. 192 | Roadside Planting and Establishment |

**Item No. 609S**
**Native Grassland Seeding and Planting for Erosion Control**

## 609S.1 Description

This item shall govern the preparation of a seeding and planting area to the lines and grades indicated on the Drawings. This may include seedbed preparation, sowing of seeds, planting of rooted plants, watering, hydromulch, compost and other management practices, as indicated in 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 with SI units shown within parentheses.

## 609S.2 Submittals

The submittal requirements for this specification item shall include:

A. Identification of the species, source, mixture and rate of application of the seeding.

B. Type of mulch or compost.

C. Watering frequency and amount.

D. Type of management practices.

## 609S.3. Materials

A. The seed furnished shall be of the previous season's crop and the date of analysis shown on each bag shall be within twelve months of the time of delivery to the project. Each variety of seed shall be furnished and delivered in separate bags or containers. A sample of each variety of seed shall be furnished for analysis and testing when directed by the Engineer or designated representative.

   The amount of seed planted per 1000 square feet (93 square meters) shall be of the type specified in section 609S.5.

B. Water shall be clean and free of industrial wastes and other substances harmful to the growth of grass in the area irrigated.

C. Topsoil see Standard Specification Item No. 601S.3(A)

D. A least toxic, integrated pest management (IPM) approach shall be used to control weeds. A written request for approval of weed control product(s) and/or materials shall be submitted to the City of Austin IPM program coordinator (499-2550) for approval.

E. Rooted plants must be healthy and free of pests. The root system should be well established and in proportion to the top growth.

**609S.4 Construction Methods**

A. General.

The Contractor shall limit preparation to areas that will be immediately seeded. All noxious weeds shall be eliminated by application of a herbicide and/or by physical removal (by the roots) prior to and/or during the seeding operation. The following list of plants are considered noxious weeds:

Table 1: Weed List

| Weed Type | Botanical Name | Common Name |
|---|---|---|
| Herb | Ambrosia spp. | Ragweed |
| Grass | Bothriochloa ischaemum | K.R. Bluestem |
| Grass | Bromus unioloides | Rescue Grass |
| Herb | Cenchrus spp. | Sandbur |
| Herb | Cnidoscolus texanus | Bull Nettle |
| Herb | Convolvulus spp. | Bindweed |
| Grass | Cynodon dactylon | Bermudagrass* |
| Herb | Cyperus esculentus | Yellow Nutsedge (Nut-grass) |
| Herb | Cyperus rotundus | Purple Nutsedge (Nut-grass) |
| Grass | Digitaria spp. | Crab Grass |
| Herb | Medicago sp. | Bur-Clover |
| Grass | Paspalum dilatatum | Dallis Grass |
| Grass | Sorghum halapense | Johnson Grass |
| Herb | Torilis arvensis | Beggar's-tick |
| Vine | Toxicodendron radicans | Poison Ivy |
| Herb | Urtica spp. | Stinging Nettle |

B. Seed Bed Preparation.

After the designated areas have been rough graded, a suitable seedbed shall be prepared. In areas where cut or fill is required, a minimum of 6 inches (150 mm) of topsoil (see Section 609S.3.C) shall be placed or existing soil (that is not infested with weeds or weed rootstock) stockpiled over the entire planting area.

In areas with no soil disturbance, the weeds shall be eliminated and a minimum of 2 inches (50 mm) of topsoil, if none currently exists, shall be placed. An even seedbed shall be prepared with limited irregularities, lumps or soil clods and the surface shall be raked to facilitate seed to soil contact.

C. Watering.

All watering shall comply with City of Austin Land Development Code requirements. Seeded areas shall immediately be watered with a minimum

of 5 gallons of water per square yard (22.5 liters of water per square meter) or as needed and in the manner and quantity as directed by the Engineer or designated representative.

Watering applications shall insure that the seedbed is maintained in a moist condition favorable for the growth of grass. Watering shall continue until minimum coverage is achieved and accepted by the Engineer or designated representative. Watering may be postponed immediately after a 1/2 inch (12.5 mm) or greater rainfall on the site but shall be resumed before the soil dries out.

Availability of water from the Austin Water Utility will be limited as stated under the Water Conservation Standard, City of Austin Land Development Code Chapter 6-2, Article II, "Water Use Management Plan Established".

The use of potable water will be restricted as stated in City of Austin Land Development Code Sections 6-4-73, 6-4-54, 6-4-63, 6-4-64, 6-4-65, 6-4-81, 6-4-92, 15-9-37(D) and 15-9-101(B).

**609S.5 Native Grassland Seeding and Planting**

All areas require both seed and rooted plants. Seeding and planting shall be performed in accordance with the requirements hereinafter described. The optimum depth for seeding shall be from 1/16 inch (1 1/2 millimeters) to 1/8 inch (3 millimeters). Seed shall be applied by a method that achieves consistent distribution and proper seed to soil contact (i.e. hand broadcasting, hydromulch, or drill method). Mulching is not required.

Species substitution, when necessary due to availability, shall be approved by the Engineer or designated representative. Only native species adapted for the designated environmental conditions shall be allowed as substitutes. Shorter growing natives such as Buffalograss should be sodded around manholes or other structures requiring higher visibility for access.

If the native grassland is being installed during the cool season (November 1 to February 15), the cool season cover crop species (as listed) shall be included in the mix.

The seed and rooted plant mixtures shall be applied in accordance with appropriate ‘growing environments’ (Upland Full Sun–Table 2, Upland Shade-Dappled-Table 3 and Facultative Moderate to High Moisture–Table 4).

Table 2. Upland Species, Full Sun Areas

| Common Name | Comments | Botanical Name | Seed application rate lbs/1000 sq. ft. (kg/100 sq. m.) | Rooted Plants Size & Spacing |
|---|---|---|---|---|
| Buffalo Grass | grass | Buchloe dactyloides | 0.3 (0.15) | 1 - 16" x 24" piece of sod @ 10' (3m) ctrs. |
| Blue Grama | grass | Bouteloua gracilis | 0.2 (0.1) | Not required |
| Green Srangletop | grass | Leptochloa dubia | 0.4 (0.2) | |
| Indian Grass | grass | Sorghastrum nutans | 0.2 (0.1) | 1 gal @ 10 ft.' (3m) ctrs. |
| Little Bluestem | grass | Schizachyrium scoparium | 0.2 (0.1) | |
| Prairie Wild Rye | grass | Elymus canadensis | 0.2 (0.1) | Not required |
| Purple Threeawn | grass | Aristida purpurea | 0.2 (0.1) | |
| Sideoats Grama | grass | Bouteloua curtipendula | 0.3 (0.15) | |
| Bluebonnet | wildflower | Lupinus texensis | 0.4 (0.2) | Not required |
| Clover (Purple Prairie) | wildflower | Petalostemum purpurea | 0.1 (0.05) | Not required |
| Coreopsis (Plains) | wildflower | Coreopsis tinctoria | 0.05 (0.025) | Not required |
| Goldenrod | wildflower | Solidago altissima | 0.02 (0.01) | Not required |
| Greenthread | wildflower | Thelesperma filifolium | 0.075 (0.037) | Not required |
| Indian Blanket | wildflower | Gaillardia pulchella | 0.15 (0.075) | Not required |
| Lemon Mint | wildflower | Monarda citriodora | 0.06 (0.03) | Not required |
| Mexican Hat | wildflower | Ratibida columnaris | 0.05 (0.025) | Not required |
| Pink Evening Primrose | wildflower | Oenethera speciosa | 0.02 (0.01) | Not required |
| Sunflower (Common) | wildflower | Helianthus annus | 0.075 (0.037) | Not required |
| Cereal rye grain* | cool season cover crop | Elymus | 0.5 (0.25) | Not required |
| Oats* | cool season cover crop | Avena sativa | 0.2 (0.10) | Not required |
| Wheat* | cool season cover crop | Triticum aestivum | 0.3 (0.15) | Not required |
| | | | | |
| TOTAL** | | | Winter: 4.0 (2.0) Summer 3.0 (1.5) | Rooted species mixed equally @ 10 ft. (3 m) ctrs. |

* Plant only between Oct. 1 and Jan. 31. Non-persistent winter cover crop for erosion control.

** Any unavailable species can be substituted with the same quantity of another species from this list or another species approved by the Engineer or designated representative.

Table 3. Upland Species, Shade-Dappled Light Areas

| Common Name | Comments | Botanical Name | Seed Application Rate lbs/1000 sq. ft. (kg/100 sq. m.) | Rooted Plants Size & Spacing |
|---|---|---|---|---|
| Meadow Sedge* | sedge | Carex perdentata | No seed required | 1 gal. @ 10' (3m) ctrs. |
| Inland Seaoats** | grass | Chasmanthium latifolium | 0.5 (0.25) | |
| Prairie Wild Rye | grass | Elymus canadensis | 0.75 (0.37) | Not required |
| Sideoats Grama | grass | Bouteloua curtipendula | 0.75 (0.37) | 1 gal. @ 10' (3m) ctrs. |
| Purple Coneflower | wildflower | Echinacea purpurea | 0.1 (0.05) | Not required |
| Coreopsis (Lanceleaf) | wildflower | Coreopsis lanceolata | 0.1 (0.05) | Not required |
| Sage (Scarlet) | wildflower | Salvia coccinea | 0.1 (0.05) | Not required |
| Drummond Phlox | wildflower | Phlox Drummondii | 0.1 (0.05) | Not required |
| Black-Eyed Susan | wildflower | Rudbeckia hirta | 0.03 (0.015) | Not required |
| Cutleaf Daisy | wildflower | Engelmannia pinnatifida | 0.2 (0.10) | Not required |
| Tall Aster | wildflower | Aster praealtus | 0.02 (0.01) | Not required |
| Illinois bundleflower | wildflower | Desmanthus illinoiensis | 0.15 (0.075) | Not required |
| Standing cypress | wildflower | Ipomopsis rubra | 0.1 (0.05) | Not required |
| Winecup | wildflower | Callirhoe involucrata | 0.1 (0.05) | Not required |
| Cereal rye grain*** | cool season cover crop | Secale cereale | 0.5 (0.25) | Not required |
| Oats*** | cool season cover crop | Avena sativa | 0.2 (0.1) | Not required |
| Wheat*** | cool season cover crop | Triticum aestivum | 0.3 (0.15) | Not required |
| | | | | |
| TOTAL**** | | | Winter: 4.0 (2.0)<br>Summer: 3.0 (1.5) | Rooted species mixed equally @ 10' (3m) ctrs. |

* If unavailable replace with other shade and drought-tolerant sedge species.
** If unavailable replace with Prairie Wild Rye.
*** Plant only between Oct. 1 and Jan. 31. Non-persistent winter cover crop for erosion control.

**** Any unavailable species can be substituted with the same quantity of another species from this list or another species approved by the Engineer or designated representative.

Table 4. Facultative Species, Moderate – High Moisture Areas

| Common Name | Comments | Botanical Name | Seed application rate lbs/1000 sq. ft. (kg/100 sq. m.) | Rooted Plants Size & Spacing |
|---|---|---|---|---|
| Big Bluestem | grass | Andropogon gerardii | 0.2 (0.1) | 1 gal. @ 10' (3m) ctrs |
| Big Muhly (Lindhiemers) | grass | Muhlenbergia lindheimeri | 0.2 (0.1) | |
| Bushy Bluestem | grass | Andropogon glomeratus | 0.2 (0.1) | |
| Eastern Gama Grass | grass | Tripsacum dactyloides | 0.3 (0.15) | |
| Indian Grass | grass | Sorghastrum nutans | 0.2 (0.1) | |
| Inland Seaoats | grass | Chasmanthium latifolium | 0.3 (0.15) | |
| Prairie Wild Rye | grass | Elymus canadensis | 0.3 (0.15) | Not required |
| Sand Lovegrass | grass | Eragrostis trichodes | 0.2 (0.1) | |
| Switchgrass | grass | Panicum virgatum | 0.1 (0.05) | 1 gal. @ 10' (3m) ctrs |
| Black-Eyed Susan | wildflower | Rudbeckia hirta | 0.06 (0.03) | Not required |
| Bundleflower (Illinois) | wildflower | Desmanthus illinoiensis | 0.35 (0.17) | Not required |
| Clover (Purple Prairie) | wildflower | Petalostemum purpurea | 0.1 (0.05) | Not required |
| Coneflower (Clasping) | wildflower | Rudbeckia amplexicaulis | 0.06 (0.03) | Not required |
| Coreopsis (Plains) | wildflower | Coreopsis tinctoria | 0.05 (0.025) | Not required |
| Goldenrod | wildflower | Solidago altissima | 0.03 (0.015) | Not required |
| Lazy Daisy | wildflower | Aphanostephus sp. | 0.03 (0.015) | Not required |
| Lemon Mint | wildflower | Monarda citriodora | 0.07 (0.035) | Not required |
| Sunflower (Common) | wildflower | Helianthus annuus | 0.15 (0.075) | Not required |
| Sunflower (Maximilian) | wildflower | Helianthus maximiliani | 0.1 (0.05) | Not required |
| Cereal rye grain* | cool season cover crop | Secale cereale | 0.5 (0.25) | Not required |

| | | | | |
|---|---|---|---|---|
| Oats* | cool season cover crop | Avena sativa | 0.2 (0.10) | Not required |
| Wheat* | cool season cover crop | Triticum aestivum | 0.3 (0.15) | |
| | | | | |
| TOTAL** | | | winter: 4.0 (2.0)<br>summer: 3.0 (1.5) | Rooted species mixed equally @ 10' (3m) ctrs. |

* Plant only between Oct. 1 and Jan. 31. Non-persistent winter cover crop for erosion control.

** Any unavailable species can be substituted with the same quantity of another species from this list or another species approved by the Engineer or designated representative.

**609S.6 Management Practices**

Weeds, as defined in the Weed List (Table 1), shall be controlled in the most efficient manner possible. The timing of weed control may occur prior to soil disturbance, just before the installation of seed, and/or during the period of grassland establishment. Weed control shall be introduced at one or all of these times, so that the greatest control is achieved. The preferred method of control is to remove weeds, either by physical or mechanical means, when the site is conducive (e.g. when the ground is moist) to this approach.

The entire root system of perennial weeds shall be removed to prevent re-sprouting. Weeds may be controlled with an approved contact, systemic herbicide, provided the product is used with appropriate care and is applied in accordance with label instructions and the following guidelines:

1. Herbicide shall not be applied when the wind is greater than 8 mph (12.9 kph),
2. Herbicide shall not be applied when rainfall is expected within 24 hours,
3. Herbicide shall not contact surface water, i.e. creeks, rivers, and lakes,
4. Herbicide shall not contact desirable vegetation (a wicking method shall be used, if necessary, to accurately contact target weed only during application).

The Engineer or designated representative shall be consulted to determine appropriate weed control management when weeds are located in an environmentally sensitive location (e.g. near water or adjacent to a critical environmental feature).

**609S.7 Measurement**

Work and acceptable material for "Native Grasslands for Erosion Control" will be measured by the square yard (square meter: 1 square meter equals 1.196 square yards) or by the acre (hectare: 1 hectare equals 2.471 acres), complete in place, with a minimum of 95 percent coverage with no bare areas exceeding 16 square feet (1.5

square meters) and a 1 1/2 inch (40 millimeters) stand of grass. Bare areas shall be reprepared and reseeded as required by the Engineer or designated representative in order to develop an acceptable stand of grass.

**609S.8 Payment**

The work performed and materials furnished and measured will be paid for at the unit bid price for "Native Grasslands For Erosion Control" of the method specified on the Drawings.

The unit bid price shall include full compensation for furnishing all materials, including all topsoil, water, seed, or fertilizer or mulch and for performing all operations necessary to complete the work.

Payment will be made under one or more of the following pay items:

| | | |
|---|---|---|
| **Pay Item No. 609S-A:** | Topsoil and Seedbed Preparation | Per Square Yard. |
| **Pay Item No. 609S-B:** | Topsoil and Seedbed Preparation | Per Acre. |
| **Pay Item No. 609S-C:** | Native Grassland Seeding and Planting | Per Square Yard. |
| **Pay Item No. 609S-D:** | Native Grassland Seeding and Planting | Per Acre. |
| **Pay Item No. 609S-E:** | Watering | Per Square Yard |
| **Pay Item No. 609S-F:** | Watering | Per Acre |
| **Pay Item No. 609S-G:** | Management Practices | Per Square Yard |
| **Pay Item No. 609S-H:** | Management Practices | Per Acre |

**End**

| ***SPECIFIC* CROSS REFERENCE MATERIALS** |
|---|
| Specification Item 609S "Native Grassland Seeding and Planting for Erosion Control" |

City of Austin Standard Specifications

| Designation | Description |
|---|---|
| Item No. 130S | Borrow |
| Item No. 606S | Fertilizer |

City of Austin Land Development Code

| Designation | Description |
|---|---|
| Section 6-4-52 | Water Use Management Plan Established |
| Section 6-4-53 | Applicability |
| Section 6-4-54 | Compliance Required |
| Section 6-4-63 | Permanent Water Use Restrictions |
| Section 6-4-64 | Water Conservation Stage One Regulations |
| Section 6-4-65 | Water Conservation Stage Two Regulations |
| Section 6-4-81 | Variance |
| Section 6-4-92 | Penalty |
| Section 15-9-37(D) | Customer's Responsibilities |
| Section 15-9-101(B) | Basis for Termination of Service |

| ***RELATED* CROSS REFERENCE MATERIALS** |
|---|
| Specification Item 609S "Native Grassland Seeding and Planting for Erosion Control" |

City of Austin Standard Specifications

| Designation | Description |
|---|---|
| Item No. 601S | Salvaging and Placing Topsoil |
| Item No. 602S | Sodding for Erosion Control |
| Item No. 604S | Seeding (Non-Native) for Erosion Control |
| Item No. 605S | Soil Retention Blanket |
| Item No. 607S | Slope Stabilization |
| Item No. 608S | Planting |

City of Austin Standards (Details)

| Standard No. | Description |
|---|---|
| 627S-1 | Grass Lined Swale |
| 62S7-2 | Grass Lined Swale W/ Stone Center |
| 633S-1 | Landgrading |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item No. 160 | Furnishing and Placing Topsoil |
| Item No. 162 | Sodding for Erosion Control |
| Item No. 164 | Seeding for Erosion Control |
| Item No. 166 | Fertilizer |
| Item No. 168 | Vegetative Watering |
| Item No. 169 | Soil Retention Blanket |
| Item No. 180 | Wildflower Seeding |
| Item No. 192 | Roadside Planting and Establishment |

**Item No. 610S**
**Preservation of Trees and Other Vegetation**

## 610S.1 Description and Definitions

This item shall govern the proper care, protection and treatment of trees and other vegetation in the vicinity of the permitted development activity (as defined in Land Development Code 25-1-21(27)). All work shall be performed in accordance with the City approved drawings and specifications (e.g. Standard Series 600) or as approved by the City Arborist (as defined below). Tree pruning and/or treatments shall be performed under the direct supervision of a qualified arborist (as defined below) or as allowed by the City Arborist.

Definitions

City Arborist – City official designated by the Director of the Planning and Development Review Department (Land Development Code 25-8-603) or as designated by the City Arborist.

Oak wilt - a tree disease caused by a fungus "Ceratocystis fagacearum" that infects the vascular system of Oak "genus Quercus" trees and prevents water transport through the trunk and canopy of the tree. This usually fatal tree disease can be spread by certain insects that come into contact with tree wounds or by interconnected tree roots. February through June is a high risk period due to the stage of the fungus and insect activity. See section 610S.4(H) for additional requirements for preventing Oak wilt infection.

Qualified Arborist – an individual engaged in the profession of arboriculture or closely related field who, through experience, education, and related training, possesses the competence to provide for, or supervise, the management of trees and other woody plants (as defined in the most current version of ANSI A300 (Part 1)-2001, section 4.1).

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

## 610S.2 Submittals

The following is a list of the minimum submittal requirements for this specification item shall include:

A. Identification of the location, type of protective fencing (i.e. A, B or C), materials of construction and installation details;

B. Qualified Arborist credentials (i.e. proof of certification from the International Society of Arboriculture, licenses, resume and/or references);

C. Type, location and construction details for proposed tree wells;

D. Location, type, materials of construction and installation details for permeable paving;

E. Proposed nutrient mix specifications and when required by the City Arborist, soil and/or foliar analysis for fertilizer applications.

**610S.3 Materials**

A. Protective Fencing and Signage

Protective fencing is designated as the materials used to protect the root zones of trees as illustrated in City of Austin Standard Detail 610S-1. Three basic types of protective fencing materials are allowed by the City of Austin. Type A and Type B are typical applications and shall be installed where damage potential to a tree root system is high, while Type C shall be installed where damage potential is minimal. The specific type of protective fencing for the work shall be as indicated on the drawings. Type C fence materials shall be subject to approval by the City Arborist. Type C fencing shall be replaced by Type A or Type B fencing as directed by the City Arborist if it fails to perform the necessary function.

1. Type A Chain Link fence (Typical Application-high potential damage)

Type A protective fencing shall be installed in accordance with City of Austin Standard Details 610S-2 and 610S-4 and shall consist of a minimum five-foot (1.5 meters) high chain link fencing with tubular steel support poles or "T" posts.

2. Type B Wood Fence (Typical Application-high potential damage)

Type B protective fencing shall be installed in accordance with City of Austin Standard Details 610S-3 and 610S-5 and shall consist of any vertical planking attached to 2x4-inch (50 x 100 mm) horizontal stringers which are supported by 2x4-inch (50 x 100 mm) intermediate vertical supports and a 4x4-inch (100 x 100 mm) at every fourth vertical support .

3. Type C Other Materials (Limited Application-minimal potential damage)

The following materials may be permitted as alternates for limited or temporary applications (3 days or less) where tree damage potential is minimal (as determined by the City Arborist):

(a) High visibility plastic construction fencing.

The fabric shall be 4 feet (1.2 meters) in width and made of high density polyethylene resin, extruded and stretched to provide a highly visible international orange, non-fading fence. The fabric shall remain flexible from -60oF to 200oF (-16oC to 93oC) and shall be inert to most chemicals and acid. The fabric pattern may vary from diamond to circular with a minimum unit weight of 0.4 lbs./Ft. (0.6 kilograms per meter).

The fabric shall have a 4 foot (1.2 meters) width minimum tensile yield strength (Horizontal) of 2000 psi [13.9 megaPascals], ultimate tensile

strength of 2680 psi [18.5 megaPascals] (Horizontal) and a maximum opening no greater than 2 inches (50 mm).

(b) Other approved equivalent restraining material.

The fencing materials, identified in (a) and (b) above, shall be supported by steel pipe, tee posts, U posts or 2" x 4" (50 mm x 100 mm) timber posts that are a minimum of 5-1/2 feet (1.68 meters) in height and spaced no more than 8 feet (2.44 meters) on centers. The fabric shall be secured to post by bands or wire ties.

4. Signage

A laminated sign, no smaller than 8.5 X 11 inches, shall be posted on each tree protective device, and at least every 100 linear feet on protective fencing, identifying the following information: Tree & Root Protection Zone, Per City of Austin code (Chapter 25-8, Subchapter B, Article 1) this protective device is to remain in place for the entirety of the development project and illegal removal is subject to fines and work suspensions. Additional information can be obtained at the City Arborist (512-974-1876) web site (http://www.ci.austin.tx.us/trees). Zona de Protección del Árbol y las Raíces: el dispositivo protector debe quedarse en el lugar para la totalidad del proyecto de la construcción. Para información adicional, contacta la Arborista Municipal (512) 974-1876 o http://www.ci.austin.tx.us/trees/trees_spanish.htm.

B. Trunk Protection (Limited Application)

When indicated on the drawings or directed by the City Arborist tree trunk protection shall be provided in accordance with City of Austin Standard Details 610S-4 and 610S-5. Tree trunk protection shall consist of any 2 x 4-inch (50 x 100 mm) or 2 x 6-inch (50 x 150 mm) planking or plastic strapping and shall be attached in a manner that does not damage the tree.

C. Tree Dressing

Wound treatments should not be used to cover wounds or pruning cuts, except when recommended for disease (see section 610S.4 (H)), insect, mistletoe, or sprout control (from ANSI A300 (Part 1)-2001, section 5.4.1).

D. Tree Wells for Raised Grades

When existing grades are raised by more than 4 inches (10.16 cm), the tree root system shall be protected by the installation of tree wells in accordance with City of Austin Standard Detail 610S-6. Native stone or non-toxic timber shall be used for the separator wall of the well and PVC conforming to ASTM D-2729, SDR-35 shall be used for the aeration systems in fill areas.

E. Permeable Paving (Environmental Criteria Manual Section 3.5.A.1)

Permeable segmented pavers in conjunction with PVC pipe aeration system or concrete on gravel base with cored holes shall be used to protect existing tree root zones when indicated on the drawings or directed by the City Arborist.

F. Fertilizer

Humate/nutrient solutions with mycorrhizae components or soil injection at recommended rates are to be used when appropriate. Construction which will be completed in less than 90 days may use materials at half the recommended rates. Alternative organic fertilizer materials are acceptable when approved by the City Arborist.

**610S.4 Construction Methods**

A. Protective Fencing

All trees and shrubs in the proximity of the construction site shall be carefully checked for damage prior to initiation of the permitted development activity.

All individual or groups of trees, shrubs, and natural areas shown to be protected on the drawings or identified to be protected by the City Arborist, shall be protected during construction with temporary fencing as indicated on the drawings or as directed by the City Arborist.

Protective fences (section 610S.4.A) shall be installed prior to the start of any site preparation work (clearing, grubbing, or grading), and shall be maintained in functioning condition throughout all phases of the construction project.

Protective fence locations in close proximity to intersecting streets or drives shall adhere to the sight distance (Section 1.3.1.C.6) and desirable sight triangle (Figure 1-6 criteria found in the City of Austin Transportation Criteria Manual).

1. Protective fences shall be constructed at the locations (typically the outer limits of the critical root zone) and with materials indicated on the drawings to prevent the following (Environment Criteria Manual, Appendix P-2, Note 6):

   (a) Soil compaction in the root zone area resulting from vehicular traffic or storage of equipment or materials.

   (b) Critical root zone disturbances due to grade changes [greater than 4" (10.16 cm) cut or fill] or trenching not reviewed and authorized by the City Arborist.

   (c) Damage to exposed roots, trunks or limbs by mechanical equipment.

   (d) Other activities detrimental to trees such as chemical storage, concrete truck cleaning, and fires.

2. Exceptions to the installation of protective fences at the tree drip lines may be permitted in the following cases:

   (a) Where there is to be an approved grade change, impermeable paving surface, tree well, or other such site development, the fence shall be erected no more than 2 feet (0.6 meters) beyond the area of disturbance unless approved by the City Arborist;

   (b) When permeable paving is to be installed within a tree's critical root zone, the fence shall be erected at the outer limits of the permeable paving area (prior to any site grading so that this enclosed area is graded separately to minimize root damage);

(c) When trees are located close to a proposed building or other construction activity (Environment Criteria Manual, Appendix P-2, Note 6.c), the fence shall be erected up to 10 feet (3 meters) to allow work space between the fence and the structure. Apply organic mulch to a depth of 8 inches [30.48 cm] in the unprotected root zone area;

(d) When there are street-side pedestrian walkways, fences shall be constructed in a manner that does not obstruct safe passage;

(e) When there are severe space constraints due to tract size or other special requirements, the Contractor shall contact the City Arborist to discuss alternatives.

When any of the exceptions listed above will result in a fence being located closer than five (5) feet (1.5 meters) to a tree trunk, the Contractor shall also protect the trunk with strapped-on planking to a height of 8 feet [2.4 meters] (or to the limits of lower branching) in addition to the fencing requirement (City of Austin Standard Details 610S-4 and 610S-5).

B. Pruning and Repair of Damage

Tree pruning, to provide clearance for the work and/or to remove hazards, shall be performed under the direct supervision of a qualified arborist and shall follow standards identified in ANSI A300 (Part 1), “Pruning”. A minimum clearance height of eight (8) feet (2.4 meters) above the street level must be provided and maintained for all existing trees if adjacent to a sidewalk. However, if the limbs of trees overhang the curb line or edge of travel lane of any street, a minimum clearance height of fourteen (14) feet (4.2 meters) is required (Transportation Criteria manual section 6.2.3,A, 4, “Clearance Height”). Pruning shall provide the minimum clearance needed to perform the work or remove a hazard unless otherwise directed by the City Arborist to comply with transportation criteria or to mitigate for damage.

If tree damage compromises a tree’s structural integrity then the area shall be adequately secured until a qualified arborist makes an assessment of the tree and corrective actions are completed with approval from the City Arborist. Damage to oak trees shall be treated immediately, with consideration for site safety, to reduce the risk of Oak Wilt infection (See 610S.4.H, “Oak Wilt Prevention”). Tree root wounds shall be treated to remove loose, damaged tissue from in and around the wound or if necessary the root shall be cut cleanly and covered with topsoil, or other material approved by the City Arborist, to prevent drying of root tissue and to create a favorable environment for root sprouting. Trunk wounds shall also be treated to remove loose, damaged tissue around the wound. Tree canopy repairs shall be performed in accordance with the most current version of ANSI A300 (Part 1), “Pruning”, to prevent further damage to the tree and to promote recovery of the tree to sound condition. The ANSI standard describes proper pruning methods for limb removal and for making finish pruning cuts.

Trees damaged or removed without prior approval or where minimum design criteria is exceeded due to failure to maintain approved tree protection shall be mitigated (Environmental Criteria Manual section 3.5.4, “Mitigation Measures”) in accordance with Land Development Code Chapter 25-8, Subchapter B, Article 1.

All trees damaged during construction shall receive an application of fertilizer within the drip line conforming to Standard Specification Item No. 606S, "Fertilizer" at the rate of 4 pounds per caliper inch (.07 kilograms per caliper mm).

C. Cutting and Filling Around Trees

When the depth of an excavation or embankment exceeds 4 inches (10.16 cm) within the critical root zone of any tree with a trunk diameter greater than 8 inches (200 mm), the City Arborist may require a tree well to be constructed per the City of Austin approved specifications and details (Section 610S.3.D and City of Austin Standard Detail 610S-6).

D. Paving Around Trees

Where new paving within the ½ critical root zone of any tree greater than a 8 inches (10.16 cm) diameter is approved, a permeable pavement and aeration system may be required by the City Arborist per the City of Austin Standard Detail (Section 610S.3.E, Environmental Criteria Manual Section 3.5.3.A.1 and Figure 3-8) must be installed as indicated on the Drawings, except for street construction.

E. Tree Removal

Tree removal shall comply with Land Development Code Chapter 25-8, Subchapter B, Article 1. An approved permit, or an approved site plan is required for removal of trees 8" and larger (see Environmental Criteria manual section 3.3.2.A.2 and figure 3-1 for measurement standards) with additional requirements for City Parkland properties and for Hill Country Roadway Corridor sites. Trees 19 inches in diameter and greater are defined as protected trees and require specific review from the City Arborist to approve a permit or site plan for removal. In addition heritage trees require a more extensive evaluation by the City Arborist and may require rulings from boards and commissions.

All trees to be removed shall be performed in a manner that does not damage the canopies, trunks or root systems of remaining trees and that protects all existing facilities, improvements and vegetation. Removal of oak trees shall follow the Oak Wilt Prevention procedures per the City of Austin Standards (Section 610S.4,(H)). All tree material shall be removed from the site unless authorized by the City Arborist or if it will be used as wood chips or mulch.

When a tree or shrub is scheduled for removal, it shall be cut to a maximum depth of 12 inches (30.5 cm) below the surrounding grade (the tree(s) should be removed at grade, and with hand saws, in situations where other tree root systems are present which are to be preserved). When applicable, after tree removal, soil shall be placed in the hole to a depth matching the existing grade.

All damage resulting from tree removal or pruning shall be repaired at the Contractor's own expense and shall follow guidelines in this specification.

F. Final Cleanup

All temporary tree and shrub preservation and protection measures shall be removed when the construction has been completed and any mulch applications shall be removed or reduced to no more than 3 inches (7.62 cm) depth.

G. Root Zone Aeration and Fertilization

As a component of an effective remedial tree care program per Environmental Criteria Manual section 3.5.4, preserved trees within the limits of construction may require soil aeration and supplemental nutrients. Soil and/or foliar analysis should be used to determine the need for supplemental nutrients. The City Arborist may require these analyses as part of a comprehensive tree care plan. Soil pH shall be considered when determining the fertilization composition as soil pH influences the tree's ability to uptake nutrients from the soil. If analyses indicate the need for supplemental nutrients, then humate/nutrient solutions with mycorrhizae components are highly recommended. In addition, soil analysis may be needed to determine if organic material or beneficial microorganisms are needed to improve soil health. Materials and methods are to be approved by the City Arborist (512-974-1876) prior to application. The owner or general contractor shall select a fertilization contractor and ensure coordination with the City Arborist.

Pre-construction treatment should be applied in the appropriate season; ideally the season preceding the proposed construction. Minimally, areas to be treated include the entire critical root zone of trees as depicted on the City approved plans. Treatment should include, but not limited to, fertilization, soil treatment, mulching, and proper pruning.

Post-construction treatment should occur during final revegetation or as determined by a qualified arborist after construction. Construction activities often result in a reduction in soil macro and micro pores and an increase in soil bulk density. To ameliorate the degraded soil conditions, aeration via water and/or air injected into the soil is needed or by other methods as approved by the City Arborist. The proposed nutrient mix specifications and soil and/or foliar analysis results need to be provided to and approved by the City Arborist prior to application (Fax # 512-974-3010). Construction which will be completed in less than 90 days may use materials at ½ recommended rates. Alternative organic fertilizer materials are acceptable when approved by the City Arborist. Within 7 days after fertilization is performed, the contractor shall provide documentation of the work performed to the City Arborist, Planning and Development Review Department. P.O. Box 1088, Austin, TX 78767. This note should be referenced as item #1 in the Sequence of Construction.

H. Oak Wilt Prevention Policy

1. Purpose and Scope

The purpose of this Oak Wilt Prevention Policy is to identify measures that city staff and city-hired contractors and their sub-contractors, who perform the services of removing or trimming trees, will take to prevent the spread of oak wilt.

2. Definitions

Oak Wilt Disease: A tree disease caused by the fungus, Ceratocystis fagacearum. The fungus infects the vascular system of a tree. The vascular system contains vessels which transport moisture throughout the tree. The vessels of an infected tree effectively become blocked by the infection of the fungus, and cannot transport adequate moisture to sustain a healthy or living tree. In most cases, the end result is tree mortality.

3 Prevention Policy

(a) Prior to beginning field work, all city staff associated with projects involving potential contact with oak trees shall be made aware of the city's official Oak Wilt Policy by receiving and reading a written copy of this policy. Staff receiving a written copy of the policy shall include, but not limited to, project managers, equipment operators responsible for removing or trimming trees, or operators using heavy equipment which could cause wounding of susceptible oaks in the use of the equipment. In addition, individual city departments will provide a written copy of the Oak Wilt Policy to contractors participating in city projects in areas where oak trees are present before initiating field work.

(b) When possible, city staff and contractors should avoid trimming, pruning, or wounding Live Oaks and Red Oaks (Spanish, Shumard, Texas Red, and Blackjack oaks) from February through June.

(c) At all times and irrespective of limb size, all cuts and wounds to oak trees shall be dressed immediately using a non-phytotoxic tree wound dressing. Stump cuts and damaged roots (both above and below ground) shall also be dressed.

(d) Disinfection of pruning tools, saws, and related equipment is mandatory during the trimming or pruning of oak trees. Disinfection of tree removal and trimming equipment shall occur before work begins in a project area, between work in individual oak trees, and again prior to leaving a project area. Acceptable disinfectants include either aerosol disinfectant or a 10 percent bleach-water solution.

*NOTE: Although this policy would require the disinfection of pruning equipment before and between oak trees as a precaution, research does not substantiate disinfection as a means of preventing the transmission of the oak wilt disease.

4. Disposal Policy

(a) Chipping or shredding the wood from infected trees to use as mulch is an acceptable means of recycling the wood. Chipping or shredding allows the wood to dry out quickly, thereby killing the fungus.

(b) Burning diseased wood is an acceptable means of disposal. Burning diseased logs will kill the fungus, and the fungus will not spread with the smoke.

(c) Logs from diseased Red Oaks, that are not chipped, shredded, or burned shall be disposed of at a landfill.

(d) Firewood from diseased Red Oak trees shall not be stored near healthy trees where fungal spores or insects that carry the spores have the potential to spread the fungus to healthy trees. It is recommended to store oak firewood under a sheet of clear plastic, tightly sealing the edges of plastic with soil or bricks. Doing so will prevent any spore carrying beetles from escaping and will solarize and heat the stored firewood to speed the drying process. It is also recommended to use

clear plastic, as black plastic will reveal any escape holes to the beetles.

(e) In situations where diseased Red Oak trees are identified and are not accessible for chipping, shredding, or removal, the trunk of the diseased tree should be girdled, and the stem treated with an appropriate herbicide to deaden the tree and hasten the desiccation and drying of the wood below the minimum moisture content that could support the development of fungal spores.

**610S.5 Measurement**

Tree and shrub pruning, fencing, drains, fertilization, etc. will not be measured for payment unless included as a contract pay item. Tree wells for tree protection will be measured by the units, complete in place, conforming to the Drawings and City of Austin Standard Detail 610S-6, "Tree Protection, Tree Wells".

Removal of existing trees will be measured per each tree.

**610S.6 Payment**

The work and materials prescribed herein with the exception of the Protective Fencing and Tree Well (Tree Protection) will not be paid for directly but shall be included in the unit price bid for the item of construction in which this activity is used, unless a payment item is included as a contract pay item.

Payment will be made under:

| | | |
|---|---|---|
| **Pay Item 610S-A:** | Protective Fencing Type A Chain Link fence (Typical Application-high damage potential) | Per Lineal Foot |
| **Pay Item 610S-B:** | Protective Fencing Type B Wood Fence (Typical Application-high damage potential) | Per Lineal Foot |
| **Pay Item 610S-C:** | Protective Fencing Type C Other Materials (Limited Application-minimal damage potential) | Per Lineal Foot |
| **Pay Item 610S-D:** | Tree Well (Tree Protection) | Per Each |
| **Pay Item 610S-E:** | Tree Trunk Protection, Wood Planking | Per Each |
| **Pay Item 610S-R:** | Removal of Existing Trees | Per Each |

**End**

| SPECIFIC CROSS REFERENCE MATERIALS |
|---|
| Specification Item 610S, “Preservation of Trees and Other Vegetation” |

**City of Austin Standard Specification Items**

| Designation | Description |
|---|---|
| **Item No. 606S** | Fertilizer |

**City of Austin Standard Details**

| Designation | Description |
|---|---|
| **Item No. 610S-1** | Tree Protection Fence Locations |
| **Item No. 610S-2** | Tree Protection Fence, Type A, Chainlink |
| **Item No. 610S-3** | Tree Protection Fence, Type B, Wood |
| **Item No. 610S-4** | Tree Protection Fence, Modified Type A, Chainlink |
| **Item No. 610S-5** | Tree Protection Fence, Modified Type B, Wood |
| **Item No. 610S-6** | Tree Protection, Tree Wells |

**City of Austin Transportation Criteria Manual**

| Designation | Description |
|---|---|
| **Section 1.3.1.C.6** | Sight Distance |
| **Section 6.2.3.A.4** | Clearance Height |
| **Figure 1-6** | Desirable Sight Triangle |

**City of Austin Environmental Criteria Manual**

| Designation | Description |
|---|---|
| **Appendix P-2, Note 6** | Exceptions to Installing Fences |
| **Appendix P-2, Note 6c** | Trees close to proposed buildings----- |
| **Appendix P-6** | Remedial Tree Care Notes |
| **Section 3.3.2.A.2** | Diameter of trees------ |
| **Section 3.5.0** | Design Criteria |
| **Section 3.5.3.A.1** | Permeable Paving |
| **Figure 3-8** | Example of Minimum Design Criteria Applied to Permeable Parking |

**City of Austin Land Development Code**

| Designation | Description |
|---|---|
| **Section 25-8-603** | Tree Protection Administration |
| **Section 25-8-623** | Inspection by City Arborist |

**ASTM, American Society for Testing and Materials**

| Designation | Description |
|---|---|
| **D-2729** | Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings |

| ***RELATED* CROSS REFERENCE MATERIALS** |
|---|
| **Specification 610S, "Preservation of Trees and Other Vegetation"** |

**City of Austin Standard Specification Items**

| Designation | Description |
|---|---|
| **Item No. 101S** | Preparing Right of Way |
| **Item No. 102S** | Clearing and Grubbing |
| **Item No. 111S** | Excavation |
| **Item No. 120S** | Channel Excavation |
| **Item No. 132S** | Embankment |
| **Item No. 608S** | Planting |

**Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges**

| Designation | Description |
|---|---|
| **Item No. 100** | Preparing Right of Way |
| **Item No. 110** | Excavation |
| **Item No. 132** | Embankment |
| **Item No. 158** | Specialized Excavation Work |
| **Item No. 160** | Furnishing and Placing Topsoil |
| **Item No. 166** | Fertilizer |
| **Item No. 168** | Vegetative Watering |

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**ITEM NO. 639S**
**ROCK BERM**

## 639S.1 Description

This item shall govern the construction of a temporary berm of open graded rock that is installed at the toe of a slope on the perimeter of a developing area. Rock berms are appropriate for use as flow diverters, energy dissipators, grade control, and level spreaders to release the water in sheet flow (Environmental Criteria Manual Section 1.4.5.E). This item shall also govern the removal of the "Rock Berm" and re-vegetation of the area.

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.

## 639S.2 Submittals

The submittal requirements for this specification item shall include:

A. Function (flow diversion, grade control, energy dissipator, level spreader, or other) and dimensions of the rock berm

B. Source, type and gradation of rock

C. Re-vegetation program, including:

1. Identification of the type, source, mixture, Pure Live Seed (PLS) and rate of application of the seeding.
2. Type of mulch.
3. Type of tacking agent.
4. Type and rate of application of fertilizer.

## 639S.3 Design Criteria

A detailed design is not required for the installation of a rock berm; however, the following criteria shall be observed:

| | |
|---|---|
| Drainage area | less than 5 acres (2 hectares). |
| Height | 18 inches (450 mm) minimum height, measured vertically from the top of the existing ground at the upslope toe to the top of the berm. |
| Top width | 2 feet (0.6 meter) minimum. |
| Side slopes | 2:1 or flatter. |
| Grade | Berms will be built along a contour as near possible to a 0 percent grade. |

**639S.4 Materials**

Surplus rock excavated from utility trenches or from other excavations may be used in construction of these berms. In general, the rocks shall be sound with a minimum of 3 inches (75 mm) in smallest dimension and shall weigh between 10 and 30 pounds (4.5 to 13.6 kilograms) each. Seeding for re-vegetation shall conform to Item No. 604S, "Seeding for Erosion Control".

Use only open-graded rock of the size indicated on Standard Detail No. 639S-1, with most of the fines removed.

**639S.5 Construction Methods**

All trees, brush, stumps and objectionable material shall be removed and disposed in a manner that will not interfere with the construction of the berm.

A trench shall be excavated to a minimum depth of 4 inches (100 mm) below existing grade for placement of the rock as indicated on Standard Detail No. 639S-1 and the Drawings. The rocks shall be placed in interlocking layers with close joints starting at the base. Open joints shall be filled with rock-spalled materials as required to stabilize the berm.

The area upstream from the rock berm shall be maintained in a condition, which will allow sediment to be removed following the runoff from a rainfall event. After each rainfall event with an accumulation of 1 inch (25 mm) or more, an inspection of the rock berm will be made by the Contractor and the stone shall be replaced, when the structure ceases to function as intended because of sediment accumulation among the rocks, washout, construction traffic damage, etc.

If the sediment reaches a depth equal to 1/3 the height of the berm or 6 inches (150 mm), whichever is less, the Contractor will remove the accumulated sediment and dispose of it at an approved disposal site in a manner that will not contribute to additional sedimentation. The berm will be reshaped as needed during construction.

When the site is completely stabilized, the berm will be removed and disposed of in a manner approved by the Engineer or designated representative.

The area will be re-vegetated as required by Item No. 604S, "Seeding for Erosion Control".

**639S.6 Measurement**

Acceptable work performed and prescribed in this item will be measured by the linear foot (lineal meter: 1 lineal meter equals 3.281 lineal feet) along the centerline of top of berm.

**639S.7 Payment**

The work performed and material furnished and measured as provided under "Measurement" to construct this item will be paid for at the unit bid price per linear foot of rock berm barrier as indicated on the Drawings. The Unit Bid Price shall include full compensation for:

(a) furnishing, hauling and placing all materials including all labor, tools, equipment and incidentals needed to complete the work,
(b) maintaining the berm,
(c) removing sediment accumulations,
(d) rock replacement,
(e) removing and disposing of all materials when the berm is no longer required and
(f) re-vegetating the site upon removal of the berm.

Payment will be made under:

| | | |
|---|---|---|
| **Pay Item No. 639S:** | Rock Berm | Per Lineal Foot. |

**End**

| ***SPECIFIC* CROSS REFERENCE MATERIALS** |
|---|
| Specification 639S, “Rock Berm" |

City of Austin Environmental Criteria Manual

| Designation | Description |
|---|---|
| Section 1.4.2.E | Rock Berm |

City of Austin Standard Details

| Designation | Description |
|---|---|
| Number 639S-1 | Rock Berm |

City of Austin Standard Specifications

| Designation | Description |
|---|---|
| Item No. 604S | Seeding for Erosion Control |

| ***RELATED* CROSS REFERENCE MATERIALS** |
|---|
| Specification 639S, “Rock Berm" |

City of Austin Environmental Criteria Manual

| Designation | Description |
|---|---|
| Table 1-1.3 | Recommended Design Values For Functional Controls |
| Table 1-2 | Maximum Water Depth At The Barrier |

City of Austin Standard Specifications

| Designation | Description |
|---|---|
| Item No. 101S | Preparing Right of Way |
| Item No. 102S | Clearing and Grubbing |
| Item No. 111S | Excavation |
| Item No. 120S | Channel Excavation |
| Item No. 401S | Structural Excavation and Backfill |
| Item No. 602S | Sodding for Erosion Control |
| Item No. 605S | Soil Retention Blanket |
| Item No. 606S | Fertilizer |

| | |
|---|---|
| Item No. 608S | Planting |
| Item No. 610S | Preservation of Trees and Other Vegetation |
| Item No. 620S | Filter Fabric |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item No. 100 | Preparing Right of Way |
| Item No. 110 | Excavation |
| Item No. 132 | Embankment |
| Item No. 158 | Specialized Excavation Work |
| Item No. 166 | Fertilizer |
| Item No. 168 | Vegetative Watering |
| Item No. 169 | Soil Retention Blanket |
| Item No. 204 | Sprinkling |

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**Item No. 641S**
**Stabilized Construction Entrance**

## 641S.1 Description

This item governs the construction of a stabilized pad of crushed stone located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk or parking area. The removal of the stabilized pad of crushed stone shall also be included in the item. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking or deposition of sediment onto public right of way (Environmental Criteria Manual Section 1.4.2.N.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.

## 641S.2 Submittals

The submittal requirements for this specification item shall include:

A. Source, type and gradation of rock

B. Drainage technique (i.e. drainage swale or entrance grading) proposed to prevent runoff from exiting the construction site.

## 641S.3 Materials

Aggregate for construction shall conform to the following gradation:

| Table 1: Aggregate Gradation Chart (TEX 401-A, % Retained per sieve) | |
|---|---|
| US 5 inch (SI 125 mm) | US 3 inch (SI 75 mm) |
| 0 | 100 |

## 641S.4 Construction Methods

All trees, brush, stumps, obstructions and other objectionable material shall be removed and disposed of in a manner that will not interfere with the excavation and construction of the entrance as indicated on the Drawings or as presented in Standard Details No. 641S-1. The entrance shall not drain onto the public right of way or shall not allow surface water runoff to exit the construction site.

When necessary, vehicle wheels shall be cleaned to remove sediment prior to entrance onto public right of way. When vehicle washing is required, it shall be done on an area stabilized with crushed stone, which drains into an approved sediment trap or sediment basin. All sediment shall be prevented from entering any storm drain, ditch or watercourse through use of sand bags, gravel, boards, silt fence (Standard Specification Item No 642S) or other methods approved by the Engineer or designated representative.

The entrance shall be maintained in a condition that will prevent tracking or disposition of sediment onto public right of way. This restriction may require periodic top dressing with additional stone as conditions demand, as well as the repair and/or cleanout of any measures used to trap sediment. All sediment that is spilled, dropped, washed or tracked onto public right of way must be removed immediately.

**641S.5 Measurement**

Acceptable work performed as prescribed in this item will be measured by unit of each stabilized construction entrance installed.

**641S.6 Payment**

The work performed and materials furnished and measured as provided under "Measurement" will be paid for at the unit bid price per lineal foot of "Stabilized Construction Entrance". The price shall include full compensation for furnishing, hauling and placing all materials, labor, tools, equipment and incidentals necessary to complete the work including inspecting, repairing, replacing and relocating existing fencing, removal of silt and removal and disposal of all materials at the completion of construction.

Payment, when included as a contract pay item, will be made under:

**Pay Item No. 641S:** Stabilized Construction Entrance Per Each.

**End**

***SPECIFIC*** CROSS REFERENCE MATERIALS

Specification 641S, "Stabilized Construction Entrance (SCE)"

City of Austin Environmental Criteria Manual

| Designation | Description |
|---|---|
| Section 1.4.2.N.4 | Stabilized Construction Entrance "Design Criteria" |

City of Austin Standard Details

| Designation | Description |
|---|---|
| Number 641S-1 | Stabilized Construction Entrance |

City of Austin Standard Specifications

| Designation | Description |
|---|---|
| Item No. 642S | Silt Fence (SF) |

***RELATED*** CROSS REFERENCE MATERIALS

City of Austin Environmental Criteria Manual

| Designation | Description |
|---|---|
| Section 1.4.2.J | Sandbag Berm |
| Figure 1-11 | Sand Bag Berm |
| Section 1.4.2.G | Silt Fence |

City of Austin Standard Specifications

| Designation | Description |
|---|---|
| Item No. 101S | Preparing Right of Way |
| Item No. 102S | Clearing and Grubbing |
| Item No. 111S | Excavation |
| Item No. 120S | Channel Excavation |
| Item No. 401S | Structural Excavation and Backfill |
| Item No. 610S | Preservation of Trees and Other Vegetation |

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

| Designation | Description |
|---|---|
| Item No. 100 | Preparing Right of Way |

| | |
|---|---|
| Item No. 110 | Excavation |
| Item No. 132 | Embankment |
| Item No. 158 | Specialized Excavation Work |
| Item No. 168 | Vegetative Watering |

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**ITEM NO. 642S**
**SILT FENCE**

## 642S.1 Description

This item shall govern the provision and placement of a silt fence fabric fence (Environmental Criteria Manual Section 1.4.5.G) including maintenance of the fence, removal of accumulated silt, removal of the silt fence and re-vegetation of disturbed areas upon completion of the project.

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.

## 642S.2 Submittals

The submittal requirements for this specification item shall include:

A. Source, manufacturer, characteristics and test data for the silt fence fabric,

B. Manufacturer, characteristics and test data for the posts and wire fence.

C. Re-vegetation program, including:

1. Identification of the type, source, mixture, Pure Live Seed (PLS) and rate of application of the seeding.
2. Type of mulch.
3. Type of tacking agent.
4. Type and rate of application of fertilizer.

## 642S.3 Materials

A. Fabric

1. General:

   The silt fence fabric shall be of nonwoven polypropylene, polyethylene or polyamide thermoplastic fibers with non-raveling edges. The silt fence fabric shall be non-biodegradable, inert to most soil chemicals, ultraviolet resistant, unaffected by moisture or other weather conditions, and permeable to water while retaining sediment. The silt fence fabric shall be supplied in rolls a minimum of 36 inches (0.9 meter) wide.

2. Physical Requirements:

   The fabric shall meet the requirements presented in Table 1, when sampled and tested in accordance with the methods indicated herein, on Standard Detail No. 642S-1 and/or on the Drawings.

B. Posts:

Posts shall be steel Tee or Y-posts, not less than 4 feet (1.22 meters) in length with a minimum weight of 1.25 pounds per foot (1.86 kilograms per meter) with a minimum Brinell Hardness of 143. Hangers shall be adequate to secure fence and fabric to posts. Posts and anchor plates shall conform to ASTM A-702. Caps are required (*not specifying discretionary criteria).

C. Wire Fence:

Wire fence shall be welded wire fabric 2 in. x 4 in. 12.5 SWG, wire diameter 0.099 in (±0.005 in.), and shall conform to Standard Specification Item No. 406, "Reinforcing Steel".

TABLE 1. Silt Fence Fabric Requirements

| Physical Properties | Method | Requirements |
|---|---|---|
| Fabric Weight in ounces per square yard (grams/square meter) | TEX-616-J[1] | 5.0 minimum (150 minimum) |
| Equivalent Sieve Opening Size: US Standard (SI Standard sieve size) | CW-02215[2] | 40 to 100 (425 to 150 □m) |
| Mullen Burst Strength: lbs. per sq. inch (psi) megaPascal (mPa) | ASTM D-3786[3] | 280 minimum (1.9 minimum) |
| Ultraviolet Resistance; % Strength Retention | ASTM D-1682[4] | 70 minimum |

[1] TxDoT Test Method Tex-616-J, "Testing of Construction Fabrics".
[2] US Army Corps of Engineers Civil Works Construction Guide Specification CW-02215, "Plastic Filter Fabric".
[3] ASTM D-3786, " Test Method for Hydraulic Bursting Strength of Knitting Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method".
[4] ASTM D-1682, " Test Methods for Breaking Load and Elongation of Textile Fabrics ".

**642S.4 Construction Methods**

The silt fence fabric shall be securely attached to the posts and the wire support fence with the bottom 12 inches (300 mm) of the material buried in a trench a minimum of 6 inches (150 mm) deep and 6 inches (150 mm) wide to prevent sediment from passing under the fence. When the silt fence is constructed on impervious material, a 12-inch (300-mm) flap of fabric shall be extended upstream from the bottom of the silt fence and weighted to limit particulate loss. No horizontal joints will be allowed in the silt fence fabric. Vertical joints shall be overlapped a minimum of 12 inches (300 mm) with the ends sewn or otherwise securely tied.

The silt fence shall be a minimum of 24 inches (0.6 meter) high. Posts shall be embedded a minimum of 12 inches (300 mm) in the ground, placed a maximum of 8 feet (2.4 meters) apart and set on a slight angle toward the anticipated runoff source. When

directed by the Engineer or designated representative, posts shall be set at specified intervals to support concentrated loads.

* Per OSHA §1926.701, 'all protruding reinforcing steel, onto and into which employees could fall, shall be guarded to eliminate the hazard of impalement'. Caps must be large enough to dissipate the forces of impact to prevent impalement from a reasonably foreseeable fall distance. It should be noted that the use of impalement protection caps is but one method of protection; covers or wooden troughs can be another means of meeting the guarding requirement. For City of Austin purposes, this also applies to t-posts and wooden stakes.

The silt fence shall be repaired, replaced, and/or relocated when necessary or as directed by the Engineer or designated representative. Accumulated silt shall be removed when it reaches a depth of 6 inches (150 mm).

**642S. 5 Measurement**

The work performed and the materials furnished under this item will be measured by the lineal foot of "Silt Fence", complete in place.

**642S.6 Payment**

The work performed and materials furnished and measured as provided under "Measurement" will be paid for at the unit bid price per lineal foot of "Silt Fence". The price shall include full compensation for furnishing, hauling and placing all materials, labor, tools, equipment and incidentals necessary to complete the work including inspecting, repairing, replacing and relocating the fence, removal of silt and removal and disposal of all materials at the completion of construction in and re-vegetation of disturbed areas.

Payment will be made under:

| | | |
|---|---|---|
| **Pay Item No. 642S:** | Silt Fence for Erosion Control | Per Lineal Foot. |

**END**

| **SPECIFIC** CROSS REFERENCE MATERIALS |
|---|
| Specification 642S, "Silt Fence" |

City of Austin Environmental Criteria Manual

| Designation | Description |
|---|---|
| Section 1.4.5.G | Silt Fence |

City of Austin Standard Details

| Designation | Description |
|---|---|
| Number 642S-1 | Silt Fence |

City of Austin Technical Specifications

| Designation | Description |
|---|---|
| Item No. 406 | Reinforcing Steel |

American Society For Testing and Materials (ASTM)

| Designation | Description |
|---|---|
| A-702 | Specification for Steel Fence Posts and Assemblies, Hot Wrought |
| D-1682 | Test Methods for Breaking Load and Elongation of Textile Fabrics |
| D-3786 | Test Method for Hydraulic Bursting Strength of Knitting Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method |

Texas Department of Transportation Manual of Testing Procedures

| Designation | Description |
|---|---|
| Tex-616-J | Testing of Construction Fabrics |

U.S. Army Corps of Engineers

| Designation | Description |
|---|---|
| CW-02215 | Civil Works Construction Guide Specification "Plastic Filter Fabric" |

| ***RELATED*** CROSS REFERENCE MATERIALS |
|---|
| Specification 642S, "Silt Fence" |

City of Austin Environmental Criteria Manual

| Designation | Description |
|---|---|
| Table 1-1.3 | Recommended Design Values For Functional Controls |
| Table 1-2 | Maximum Water Depth At The Barrier |

City of Austin Standard Specifications

| Designation | Description |
|---|---|
| Item No. 101S | Preparing Right of Way |
| Item No. 102S | Clearing and Grubbing |
| Item No. 111S | Excavation |
| Item No. 120S | Channel Excavation |
| Item No. 401S | Structural Excavation and Backfill |
| Item No. 610S | Preservation of Trees and Other Vegetation |

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**ITEM NO. 648S**
**MULCH SOCK**

## 648S.1 Description

A Mulch sock consists of material encased in a tube of mesh. It is used to intercept, settle, and filter sheet flow and pond runoff. Mulch socks provide an environmentally sensitive and cost-effective alternative to sediment fences.

## 648S.2 Submittals

The submittal requirements for this specification item shall include the following:

A. Mulch Material

1. A small sample of mulch material proposed to be used on the site will be provided to the engineer.
2. Provide a designated project stockpile of mulch for sampling and testing at the producer's site.
3. A copy of the lab analysis, performed by an STA-certified lab, verifying that the mulch material meets the requirements of Table 1.

Table 1

| Item | Requirement | Reference Specification |
|---|---|---|
| Particle Size | 3" minus screening process | Equivalent to TXDOT item 161, Compost, Section 1.6.2.B, Wood Chip requirements |
| pH | 5.5 – 8.5 | TMECC 04. 11-A, "1.5 Slurry pH" |
| Organic Matter Content | 25%, dry weight basis | TMECC 05.07-A, "Loss-On-Ignition Organic Matter Method" |

B. Tube Material

The CONTRACTOR shall submit a sample of the material that the CONTRACTOR proposes to use on the project. A sample of the material should be accompanied by material data sheet identifying composition, ability of the material to biodegrade, and size of openings in tube at a minimum.

### 648S.3 Materials

A. Mulching material can be manufactured on or off the project site and may consist of:

1. Shredded bark
2. Stump grindings
3. Composted bark

B. The mulch shall have the following composition:

1. Wood chips shall be produced from a 3-inch minus screening process (equivalent to TxDOT item 161, Compost, Section 1.6.2.B Wood Chip Requirements).
2. Large portions of silts, clays, or fine sands are not acceptable.
3. The pH of the mulch shall be between 5.5 and 8.5.
4. The organic matter content shall be greater than or equal to 25% on a dry weight basis.

C. Mulch material must be free of refuse, physical contaminants, and material toxic to plant growth. It is not acceptable for the mulch material to contain ground construction debris, biosolids, manure, or recyclable material.

D. Prior to placement, a representative sample of the mulching material must be tested and certified by the project engineer or his/her designee and accepted by the city inspector.

E. “Sock” material will be 100% biodegradable, photodegradable, or recyclable such as burlap, twine, UV photodegradable plastic, polyester, or any other acceptable material. The material mesh opening should be equal to or less than 3/8 inch (10 mm) and the material tensile strength should be equal to or greater than 44 psi (3.09 kg/cm2).

### 648S.4 Installation

A. Use 12 or 18 inch diameter mulch socks for all sediment control applications. This diameter of mulch sock material has proven to be the most consistent for all sediment control applications (TxDOT, April 2006).

B. Install mulch socks per Figure 1.4.5.F in the City of Austin Environmental Criteria Manual.

C. Mulch socks should be used at the base of slopes no steeper than 2:1 and should not exceed the maximum spacing criteria provided in the following table.

| Slope | Max. Slope Length Between *18 in. Dia. Sock* (ft) | Max. Drainage Area (sf) per 100ft of Sock |
|---|---|---|
| 100:1 - 50:1 | 100 | 10,000 |
| 50:1 - 30:1 | 75 | 7,500 |
| 30:1 - 25:1 | 65 | 6,500 |
| 25:1 - 20:1 | 50 | 4,800 |
| 20:1 - 10:1 | 25 | 2,600 |
| 10:1 - 5:1 | 15 | 1,300 |
| 5:1 - 2:1 | 10 | 1,000 |

| Slope | Max. Slope Length Between *12 in. Dia. Sock* (ft) | Max. Drainage Area (sf) per 100ft of Sock |
|---|---|---|
| 100:1 - 50:1 | 100 | 6,000 |
| 50:1 - 30:1 | 40 | 4,000 |
| 30:1 - 25:1 | 30 | 3,000 |
| 25:1 - 20:1 | 25 | 2,600 |
| 20:1 - 10:1 | 15 | 1,300 |
| 10:1 - 5:1 | 10 | 1,000 |
| 5:1 - 2:1 | 5 | 500 |

D. Place mulch socks at a 5 ft or greater distance away from the toe of the slopes to maximize space available for sediment deposition.

E. When placed on level contours, sheet flow of water should be perpendicular to the mulch sock at impact and unconcentrated.

F. Install mulch socks using rebar (#5 minimum with safety caps) a minimum of 48 inches in length placed on 2-ft centers. In order to prevent the movement or floating of the mulch sock during rain events or construction operations, install steel posts on alternating sides of the sock. Drive the posts into the ground to a minimum depth of 24 inches, leaving less than 12 inches of post above the exposed mulch sock.

G. In order to prevent water flowing around the ends of the mulch socks, point the ends of the socks up slope.

H. In order to prevent water from flowing between the gaps at adjacent ends of mulch socks, overlap the ends of adjacent mulch socks a minimum of 12 inches. Never stack mulch socks on top of one another.

I. Mulch Socks should be placed using ‘smiles’ and ‘j-hooks’. See ECM Section 1.4.5 G (Silt Fence)

J. For steeper slopes, an additional mulch sock can be constructed on the top of the slope and within the slope area as determined by specific field conditions. Multiple mulch socks are recommended on steeper slopes.

K. Do not use mulch socks in areas of concentrated flow as they are intended to control sheet flow only.

### 648S.5 Inspection and Maintenance

A. Inspect mulch socks after installation for gaps under the mulch socks and for gaps between the joints of adjacent ends of mulch socks. Contractor shall repair gaps such that no water flows under or around sock.

B. Inspect every seven days and within 24 hours of a rainfall event of 0.5 inches or greater. Replace and repair mulch socks as necessary.

C. Sediment retained by the mulch socks shall be removed when it has reached one third of the exposed height of the mulch socks.

D. Mulch socks can be vegetated or un-vegetated. Vegetated mulch socks can be left in place. The vegetation will grow in the slope, further anchoring the sock.

### 648S.6 Payment

The work performed and the materials furnished as prescribed by this item shall be paid for by the linear foot of mulch sock installed.

Payment will be made under:

| | | |
|---|---|---|
| **Pay Item No. 648S:** | Mulch Sock | Per Lineal Foot. |

**END**

| ***SPECIFIC* CROSS REFERENCE MATERIALS** |
| --- |
| Specification Item No. 648S, “Mulch Sock” |

City of Austin Environmental Criteria Manual

| Designation | Description |
| --- | --- |
| 1.4.5.F | Mulch Sock |
| 1.4.5.G | Silt Fence |

City of Austin Standard Details

| Designation | Description |
| --- | --- |
| 648S-1 | Mulch Sock |

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**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. 720S**
**Metal for Structures**

## 720S.1 Description

This item shall govern all structural and miscellaneous steel, anchor bolts, and miscellaneous metals used in structures. Reinforcing steel (Item 406S) and other structural materials are not included. This specification is optional and 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.

## 720S.2 Submittals

The submittal requirements of this specification item include:

A. Certification or mill test reports indicating that all materials supplied are in accordance with this specification.

B. Any material proposed for use and not designated herein, including type and trade name for any material not generically specified by the American Society for Testing and Materials (ASTM). Submittal shall include material specification and technical data as required to show that the proposed material meets the intent of those specified herein.

C. When SI unit bolts are proposed for use on a project, submit sizing of bolt(s) and the U.S. Customary Unit (USCU) bolt size(s) the SI unit bolt(s) will be substituted for. Note: although this specification includes ASTM standards for both USCU and SI, there is no conversion between these standards; each contains a different set of bolts with different physical size characteristics. When SI unit bolts are used, appropriately sized SI unit nuts and washers shall also be provided.

## 720S.3 Structural Steel for Main Members

Unless otherwise indicated, structural steel for main members shall conform to the longitudinal Charpy V-notch (CVN) requirements in accordance with Table A. Sampling and testing shall be in accordance with ASTM A673 (A673M).

A. Structural Steel

When indicated as Structural Steel, the material shall conform to ASTM A 36 (A36M), with a minimum specified yield strength of 36 ksi (250 MPa).

B. High Strength Structural Steel (HS)

When indicated as Structural Steel-HS, the material shall have a minimum required yield strength of 50 ksi (345 MPa), conforming to one of the following ASTM specifications:

1. ASTM A 572 (A572M).

2. ASTM A 588 (A588M).

3. ASTM A709 (A709M).

4. ASTM A992 (A992M).

C. Extra High Strength Structural Steel (XHS)

When indicated as Structural Steel-XHS, the material shall have a minimum specified yield strength of 90 ksi (620 MPa), conforming to one of the following ASTM specifications:

1. ASTM A 514 (A514M). Structural shapes and seamless tubing, meeting the requirements of A514 (A514M) will be permitted with a maximum tensile strength of 140 ksi (965 MPa) for structural shapes and 145 ksi (1,000 MPa) for seamless tubing.

2. ASTM A 517 (A517M).

ASTM A514 (A514M) and ASTM A517 (A517M) steels are considered weldable.

| TABLE A | | | | |
|---|---|---|---|---|
| Min. Spec. Yield Strength, Fy [ksi (MPa)] | Thickness, t [in. (mm)] | Welded | Mech. Fastened | Min. CVN Toughness [ft. lb. @ °F (J @ °C)] |
| Fy ≤ 40 (275) | t ≤ 4 (100) | X | X | 15 @ 70 (20 @ 21) |
| 40 (275)< Fy ≤ 65 (450) | t ≤ 2 (50) | X | X | 15 @ 70 (20 @ 21) |
| | 2 (50) < t ≤ 4 (100) | | X | 15 @ 70 (20 @ 21) |
| | 2 (50) < t ≤ 4 (100) | X | | 20 @ 70 (27 @ 21) |
| 65 (450)< Fy ≤ 90 (620) (Refer to note 3 below) | t ≤ 2.5 (65) | X | X | 20 @ 50 (27 @ 10) |
| | 2.5 (65) < t ≤ 4 (100) | | X | 20 @ 50 (27 @ 10) |
| | 2.5 (65) < t ≤ 4 (100) | X | | 25 @ 50 (34 @ 10) |

Notes for Table A:
1. For Fy ≤ 50 ksi (345 MPa), use the (H) frequency of testing in accordance with ASTM A673 (A673M).
2. For Fy > 50 ksi (345 MPa), use the (P) frequency of testing in accordance with ASTM A673 (A673M).
3. If the yield strength of the material exceeds 90 ksi (585 MPa), the testing temperature shall be reduced 15°F (8.3°C) per 10 ksi (69 MPa) increment, or portion thereof.

## 720S.4 Miscellaneous Steel

A. High Strength Bolts

High strength bolts shall conform to ASTM A325, A325M, A490, or A490M, unless otherwise indicated. For submittal requirements of SI unit bolts, refer to 720S.3 C. Nuts for high strength bolts shall conform to ASTM A563 or A563M and washers shall conform to ASTM F436 or F436M.

B. Unless otherwise indicated, structural steel for secondary members such as shoes, diaphragms, stiffeners, bearing stiffeners, lateral bracing, diagonals, armor joints, and finger joints shall conform to one of the following:

1. ASTM A36 (A36M), with a minimum specified yield strength of 36 ksi (250 MPa).

2. ASTM A500, with a minimum specified yield strength of 46 ksi (315 MPa).

Structural steels used for secondary or nonstress-carrying members will not be subject to

impact requirements.

All steels greater than 0.5 inch (13 mm) in thickness used for structural supports for highway signs, luminaries, and traffic signals shall conform to the longitudinal Charpy V-notch requirements of Table A.

C. Stud shear connectors, slab anchors, and anchors on armor and finger joints shall conform to ASTM A108, Grades 1015, 1018, or 1020, either semi- or fully-killed, with a minimum specified yield strength of 50 ksi (345 MPa).

D. Piling

Steel piling shall conform to one of the following:

1. ASTM A36 (A36M), with a minimum specified yield strength of 36 ksi (250 MPa).

2. ASTM A252, greater than or equal to 10 gauge, with a minimum specified yield strength of 35 ksi (240 MPa).

3. ASTM A328 (A328M), with a minimum specified yield strength of 39 ksi (270 MPa).

4. ASTM A1011 (A1011M), with a minimum specified yield strength of 33 ksi (230 MPa).

E. Deck Plates

Material for deck plates shall be corrosive-resistant structural steel conforming to ASTM A242 (A242M). The material must be of weldable quality and shall contain alloying elements that furnish corrosion resistance at least twice that of copper bearing structural steel. The type and trade name shall be submitted for review.

F. Rail Posts

Material for rail posts shall conform to ASTM A36 (A36M), with a minimum specified yield strength of 36 ksi (250 MPa).

G. Forgings

Steel forgings from which pins, rollers, trunnions, or other forged parts are to be fabricated shall conform to ASTM A668 (A668M), class C, D, F, or G, with a minimum specified yield strength of 33 ksi (230 MPa). As an alternate for pins four (4) inches in diameter or less, ASTM A108, grades 1016-1030, with a minimum specified yield strength of 36 ksi (250 MPa) may be used.

H. Castings

Steel castings shall conform to ASTM A27 (A27M), Grade 70-36, with a minimum specified yield strength of 36 ksi (250 MPa).

I. Anchor Bolts

Anchor bolts shall conform to one of the following:

1. Plain and threaded bars used for anchorage purposes, ASTM A36 (A36M).

2. Headed bolts and nuts, ASTM A307, Grade A.

3. High strength anchor bolts, ASTM A193 (A193M). Nuts for high strength anchor bolts shall conform to ASTM A194 (A194M).

Anchor bolts shall not be galvanized unless otherwise indicated. When galvanized, anchor bolts and nuts shall be tapped or chased after galvanizing.

When heat treated material is specified or required, the test report for certification shall include the necessary certification relative to the heat treating process.

J. Steel Pipe

Steel pipe shall conform to Item No. 510, “Pipe”.

K. Tubing

Steel tubing shall conform to one of the following:

1. ASTM A500, Grade B.

2. API Standard 5L, Grade X52, except as noted herein, may be used if produced by a mill recognized as authorized to produce pipe with the API monogram and listed as such in the standard API specifications. Hydrostatic tests will not be required.

In lieu of the mill test report, a certificate from the manufacturer will be required for each lot or shipment certifying that the tubing meets the requirements stated above.

L. Pipe Rail

Pipe rail shall be construed to include special extruded and bent shapes and shall be of the section indicated. Pipe may be rolled or extruded to the shape indicated or may be cold pressed from a round pipe or flat plate.

If cold pressed, the design of the press and dies shall result in a pipe of uniform section and free from die marks. After the pipe has been formed to the required section, it shall be cut to the lengths required. The end cuts and notches shall be made at such angles with the axis of the pipe as required to produce vertical end faces and plumb posts when indicated. Cutting and notching of pipe shall be done with a saw or machine guided torch or other means that will insure a neat and uniform finish.

M. Deep Beam Rail

Deep beam rail shall conform to AASHTO M180, 10 or 12 gage (exclusive of protective

coating). The terminal connector shall be of the same material, not less than 10 gage. Unless otherwise indicated, the rail element shall be galvanized.

**720S.5 Miscellaneous Metals**

A. Iron

All iron castings shall be true to pattern in form and dimensions, free from pouring faults, sponginess, cracks, blow holes, and other defects in positions affecting their strength and value for the service intended. Castings shall conform to the following ASTM designations:

1. Malleable iron, ASTM A47 (A47M), grade 35018.
2. Gray iron, ASTM A48 (A48M), class 30 or 35.
3. Ductile iron, ASTM A536, grade 60-40-18 or 65-45-12.

B. Lead

Sheet lead shall conform to ASTM B29, refined lead or pig.

C. Copper

Copper strip or sheet shall conform to the following:

1. ASTM B100, alloy 510 or 511.
2. ASTM B152 (B152M).

D. Aluminum

Unless otherwise indicated, aluminum materials shall conform to the following:

1. Castings, ASTM B108, alloy A444-T4.
2. Extrusions, ASTM B221, alloy 6061-T6.
3. Sheet and plate, ASTM B209, alloy 2024-T3. If welding is required, alloy 6061-T6 can be substituted, but must be heat treated after fabrication and welding.
4. Deep beam rail, ASTM B209, alloy 2024-T3. The minimum thickness of the rail element shall be 0.156 inch (nominal) unless otherwise indicated.

E. Bronze

Bronze bearing and expansion plates shall conform to ASTM B22, alloy 911.

**720S.6 Fabrication, Erection, and Painting**

Fabrication, erection, and painting of metal for structures shall conform to the following:

A. Item No. 721S, "Steel Structures".

B. Item No. 722S, "Paint and Painting". Aluminum or galvanized steel members shall not require painting.

C. Item No. 723, "Structural Welding".

**720S.7 Galvanizing**

Galvanizing, where indicated, shall conform to the following:

A. Fabricated items, rolled, pressed or forged steel shapes, plates, pipes, tubular items, and bars, ASTM A123 (A123M).

B. Steel or iron castings, ASTM A153 (A153M).

C. Bolts, nuts, screws, washers, and other miscellaneous hardware, ASTM A153 (A153M), Class C or D or ASTM B695, Class 50.

The measurements of thickness and weight of galvanized coating shall be in accordance with TxDOT test method Tex-728-I.

**720S.8 Measurement**

Measurement shall be in accordance with the following:

A. Weights of supplied metal for structures shall be determined in accordance with Table B:

| TABLE B | |
|---|---|
| Material | Weight [lb./cu. ft. (kg/cu. m)] |
| Steel | 490 (7,849) |
| Iron, cast | 450 (7,208) |
| Iron, wrought | 485 (7,769) |
| Lead | 710 (11,373) |
| Copper | 556 (8,906) |
| Aluminum | 165 (2,643) |
| Bronze | 509 (8,153) |

B. Weights of bolts, nuts, and washers shall be in accordance with the American Institute of Steel Construction's "Steel Construction Manual".

C. The quantity of metal for structures furnished and placed will be based on the weight of metal in the fabricated structure. The weight of erection bolts, paint or weld metal shall be excluded.

D. The weights of secondary metals in steel or concrete structures (such as castings, bearing plates, anchor bolts, drains, deck plates, armor joints, and finger joints) for which no separate measurement is specified, shall be in accordance with this specification.

E. The weights of rolled shapes and plates shall be computed on the basis of their normal weights and dimensions.

F. The weights of castings will be computed from the dimensions indicated.

G. Deductions will be made for all cuts, copes, perforations, and all holes except bolt holes.

Splices will be measured as follows:

A. No additional weight will be allowed for weld metal in a welded splice.

B. Where a bolted splice is permitted as an alternate for a welded splice, measurement will be made on the basis of a welded splice.

C. Where a bolted splice is required, the weight of splice material, bolt heads, washers and nuts, with no deduction for holes, will be measured.

A change in design may be required and approved by the Engineer or designated representative, due to unforeseen conditions or other reason, which either increases or decreases the quantity of metal in the completed structure; the increase or decrease in weight will be measured in accordance with this specification and shall be included as a change from the original quantity computed. No adjustment will be made for a change which has not been approved by the Engineer or designated representative and which either increases or decreases the quantity of metal in the completed structure. These changes are subject to approval by the Engineer or designated representative nonetheless to assure that the completed structure is in accordance with the original design intent.

**720S.9 Payment**

Structural steel for main members will be paid for at the unit price bid per pound for “Structural Steel”, “Structural Steel-HS”, “Structural Steel-XHS”, or such other classification(s) of metal indicated.

Shipping invoice or acceptance slip weights will not be used as basis for payment.

Payment will be made based on the quantity indicated, except as may be modified by the following:

A. Either party to the contract may request an adjustment of the quantities indicated (by each separate bid item), if the weights calculated in accordance with this specification vary from those indicated by more than the following:

   1. Over 500 tons – 0.5 percent.

   2. 50 tons through 500 tons – 1 percent.

   3. Less than 50 tons – 1.5 percent.

   When adjustment is required, the Contractor shall furnish the Engineer or designated representative three sets of shop bills showing the calculated weights of all parts of the

structure. The weights shall be computed from the approved shop drawings, except as noted above. When this quantity is certified correct by the Engineer or designated representative, it will become the revised plan quantity. Quantities revised in this manner will not be subject to the provisions of the "General Conditions".

B. When quantities are revised by a change in design, the plan quantity will be increased or decreased by the amount involved in the design change. Quantities revised in this manner will be subject to the provisions of the "General Conditions".

The unit bid price(s) shall include full compensation for furnishing all materials and for all fabrication, shopwork, transportation, erection, paint, painting, galvanizing, and for furnishing all equipment, tools, labor, and incidentals necessary to complete the work.

Payment, when included as a contract pay item, will be made under:

| | | |
|---|---|---|
| **Pay Item No. 720S-A:** | Structural Steel | Per Pound. |
| **Pay Item No. 720S-B**: | Structural Steel-HS | Per Pound. |
| **Pay Item No. 720S-C:** | Structural Steel-XHS | Per Pound. |

**End**

| SPECIFIC Cross Reference Materials |
|---|
| Specification Item 720S, “Metal for Structures” |

City of Austin Standard Specification Items

| Designation | Description |
|---|---|
| Item 510 | Pipe |
| Item 721S | Steel Structures |
| Item 722S | Paint and Painting |
| Item 723 | Structural Welding |

American Association of State Highway and Transportation Officials (AASHTO)

| Designation | Description |
|---|---|
| M180 | Standard Specification for Corrugated Sheet Steel Beams for Highway Guardrail |

American Petroleum Institute (API)

| Designation | Description |
|---|---|
| 5L | Line Pipe |

American Society for Testing and Materials (ASTM)

| Designation | Description |
|---|---|
| A27/A27M | Standard Specification for Steel Castings, Carbon, for General Application |
| A36/A36M | Standard Specification for Carbon Structural Steel |
| A47/A47M | Standard Specification for Ferritic Malleable Iron Castings |
| A48/A48M | Standard Specification for Gray Iron Castings |
| A108 | Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished |

| | |
|---|---|
| A123/A123M | Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products |
| A153/A153M | Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware |
| A193/A193M | Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications |
| A194/A194M | Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both |
| A242/A242M | Standard Specification for High-Strength Low-Alloy Structural Steel |
| A252 | Standard Specification for Welded and Seamless Steel Pipe Piles |
| A307 | Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength |
| A325 | Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength |
| A325M | Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength [Metric] |
| A328/A328M | Standard Specification for Steel Sheet Piling |
| A370 | Standard Test Methods and Definitions for Mechanical Testing of Steel Products |
| A490 | Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength |
| A490M | Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints [Metric] |
| A500 | Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes |
| A514/A514M | Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding |
| A517/A517M | Standard Specification for Pressure Vessel Plates, Alloy Steel, High-Strength, Quenched and Tempered |
| A536 | Standard Specification for Ductile Iron Castings |
| A563 | Standard Specification for Carbon and Alloy Steel Nuts |
| A563M | Standard Specification for Carbon and Alloy Steel Nuts [Metric) |
| A572/A572M | Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel |
| A588/A588M | Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi [345 MPa] Minimum Yield Point to 4-in. [100-mm] Thick |
| A668/A668M | Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use |
| A673/A673M | Standard Specification for Sampling Procedure for Impact Testing of Structural Steel |
| A709/A709M | Standard Specification for Structural Steel for Bridges |
| A992/A992M | Standard Specification for Structural Steel Shapes |

| | |
|---|---|
| A1011/A1011M | Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength |
| B22 | Standard Specification for Bronze Castings for Bridges and Turntables |
| B29 | Standard Specification for Refined Lead |
| B100 | Standard Specification for Wrought Copper-Alloy Bearing and Expansion Plates and Sheets for Bridge and Other Structural Use |
| B152/B152M | Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar |
| B108 | Standard Specification for Aluminum-Alloy Permanent Mold Castings |
| B209/B209M | Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate |
| B221/B221M | Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes |
| B695 | Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel |
| F436 | Standard Specification for Hardened Steel Washers |
| F436M | Standard Specification for Hardened Steel Washers [Metric] |

TxDOT Specifications

| Designation | Description |
|---|---|
| Tex-728-I | Measurements of Dry Film Coating Thickness on Steel |

| RELATED Cross Reference Materials |
|---|
| Specification Item 720S, “Metal for Structures” |

City of Austin Standard Specification Items

| Designation | Description |
|---|---|
| Item 406S | Reinforcing Steel |

American Society for Testing and Materials (ASTM)

| Designation | Description |
|---|---|
| A370 | Standard Test Methods and Definitions for Mechanical Testing of Steel Products |

**Item No. 721S**
**Steel Structures**

## 721S.1 Description

This item shall govern the furnishing, fabricating, erecting, and painting steel and other metals for structures or portions of structures. The materials related to this specification are specified in Item 720S, "Metal for Structures" unless otherwise noted. Reinforcing steel (Item 406S) and other structural materials are not included. This specification is optional and 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.

## 721S.2 Submittals

The submittal requirements of this specification item include*:*

A. Shop Drawings

1. The Contractor shall prepare and submit seven (7) copies of detailed shop drawings (or as required by the Contract Documents) for each detail of the Contract Drawings requiring the use of materials specified herein or in Item No. 720S, "Metal for Structures".

2. Shop drawings shall include complete details and schedules for fabrication and assembly, as well as camber and erection diagrams for all structures, bridges, plate girders, and other structural members as indicated on the drawings. The equipment, sequence of erection, location and type(s) of falsework (including calculations), location of splices, and proposed method of support to determine any overstress caused by the erection procedure shall also be included.

3. The drawings shall be prepared on sheets 22 x 36 inches (A1 sheet size or 559 x 914 mm) or larger. Each sheet shall include the following:

   a. Project name and location.

   b. Name of structure or detail. For details, include structure name or location of detail within the project.

   c. Fabricator name and person responsible for preparation of drawing.

   d. Contractor name.

   e. Sheet numbering.

3. Preparation and submission of shop drawings may be on 11 x 17 inch sheets (A3 sheet size or 279 x 432 mm) or full size drawings may be reduced to half scale size if they are completely clear and legible.

4. Field Verification

   a. The Contractor shall be responsible for field verification of design information and

shall inform the Fabricator of any discrepancies with the Contract Documents.

b. When discrepancies are more than minor dimensional changes, the Contractor shall resolve with the Architect/Engineer.

c. Any changes from the Contract Documents due to field verification of information shall be clearly noted on the shop drawings.

5. All shop drawings shall be checked by the Fabricator before submitting them to the City of Austin. The Contractor shall also be responsible for reviewing the shop drawings prior to submittal to assure correctness and completeness and to coordinate shop fit and field connections. Resolution of problems and corrections to drawings, if necessary, shall be done prior to submittal.

6. Changes in section(s), as allowed per this specification (P721S.4 C), shall be clearly noted on the shop drawings.

7. Members proposed for heat curving. Also include with the shop drawings a detailed procedure for heat curving work.

8. Color coding for any grade of steel to be used on the project and not listed in ASTM A6 (A6M).

B. Painting shall conform to Item No. 722S, "Paint and Painting". Submit any proposed shop primers or paints that are not otherwise specified.

C. Connections

1. When structural members are to be fabricated by welding, a welding procedure shall be submitted. A welding procedure shall include the standard AWS symbol, size, length, type of weld, and any other pertinent information. Upon approval, the welding procedure will be assigned a Welding Procedure Number and the shop drawings shall include this number adjacent to the appropriate welding symbol.

2. When structural members with calculated stress are to fabricated by bolting, a fabrication procedure shall be submitted . A fabrication procedure shall include a list of equipment to be used, sequence of assembly, sequence and detail of connections made, special processes such as planing, facing, etc., detail of heat treating procedures, when applicable and any other information concerning fabrication, as may be required by the Engineer/Architect.

3. Submit seven (7) copies of connection procedures along with the shop drawings.

4. Provide calculations for all standard connections, sealed by a Licensed Professional Engineer registered in the state of Texas.

D. Product Data

1. Submit product data for all items in accordance with this specification and those materials specified in Item No. 720S, “Metal for Structures”. Include certification, mill

test reports, or other data as required. Mill test reports will not be required for miscellaneous hardware.

2. Quality Control

   a. The Contractor shall provide, if requested, facilities in the shop and as many helpers as needed for the inspector to properly inspect the materials and work quality. The Inspector shall be allowed free access to the necessary parts of the work.

   b. The inspector will have the authority to reject any material or work which does not meet the requirement of this specification. In case of dispute, the Contractor may appeal to the Engineer or designated representative, whose decision will be final.

   c. The acceptance of any material or finished members by the inspector will not prohibit subsequent rejection if found defective. Rejected material shall be replaced promptly, or made good by the Contractor to the satisfaction of the Engineer or designated representative.

3. As materials are shipped, the Fabricator shall furnish the Engineer or designated representative with four (4) copies of the shipping invoice. The Fabricator's shipping invoice shall include:

   a. Member piece mark identification.

   b. Number of pieces shipped.

   c. Total calculated or scale weight for each shipment per bid item.

4. Final payment for structural steel will not be made until shipping invoices indicating total weight of material used have been received and checked by the Engineer or designated representative. Shipping weights will not be used as measurement for payment.

E. Notice of Beginning Fabrication Work

1. The Contractor shall give the Engineer or designated representative seven (7) days notice prior to the beginning of fabrication work in the shop.

2. No work shall be performed in the shop before the Engineer or designated representative has authorized fabrication. Any purchases of material prior to authorization shall be at the Contractor's risk.

F. Material Safety Data Sheets (MSDS)

Submit MSDS for materials as required and keep on the project job site.

G. Welder Certifications

Provide certification that welders working on the project have satisfactorily passed qualification tests in accordance with AWS D1.1 (D1.1M). If recertification is required, retesting will be at the Contractor’s expense.

H. Repair Procedures

Submit repair procedures in accordance with the requirements herein.

**721S.3 Delivery, Storage, and Handling**

A. Delivery

1. Deliver materials to the site at such intervals as required so as to ensure uninterrupted progress of work.

2. Anchor bolts, anchorages, and other embedded items shall be delivered to the site in ample time so as not to delay related work. Also, provide setting drawings, templates, and directions for installation as required to properly install these items.

B. Storage and Handling

1. Store materials so as to permit easy access for inspection and identification. Do not store materials in a manner that might cause distortion or damage to materials or support.

2. Keep materials off the ground using pallets, platforms or other supports.

3. Protect materials from corrosion and deterioration.

4. If bolts and nuts become dry or rusty, clean and lubricate them before use.

C. Repair or replace damaged materials, structures, or portions of structures as directed.

D. The handling of material, fabrication, blocking of partially completed members, and movement of completed members shall be done in such a manner that the safety of workers and inspection personnel will not be impaired at any time.

E. The storage, handling, and cleaning of corrosion resistant ("weathering") steel shall be in accordance with ASTM A242 (A242M), ASTM A588 (A588M), or the requirements of the proprietary manufacturer as applicable.

**721S.4 Quality of Work**

A. Fabrication and Assembly

1. Fabrication shall be in accordance with either AISC 325 or 360.

2. Fabricate and assemble structural assemblies in the shop when possible. When shop fabrication is not practical, provide markings as required to facilitate assembly.

3. Fabricate in such a manner so as to limit storage and handling and not to hinder construction progress.

B. Fabrication tolerances for rolled shapes, plate girders, plates, bars, wide flange sections, and miscellaneous steel shall be in accordance with ASTM A6 (A6M) or AWS D1.5 (D1.5M).

C. Rolled fabricated sections of slightly different dimensions and weight than the standard sections shown will be acceptable, provided they have equal or greater Moment of Inertia and Section Modulus than the section(s) detailed. . Changes in section(s) shall be clearly noted on the shop drawings.

D. Maximum deviation from flatness for webs of wide flange sections shall be the same as for built-up girders.

E. Shoes shall be fabricated with a tolerance not greater than the following:

1. The top bolster shall have the center 75 percent of the long dimension true to 1/32 inch (0.8 mm), with the remainder true to 1/16 inch (1.6 mm) and shall be true to 1/32 inch (0.8 mm) across its entire width in the short dimension.

2. For a pin and rocker type expansion shoe, the axis of rotation shall coincide with the central axis of the pin.

3. When the shoe is completely assembled and the top bolster is moved horizontally simulating the movement of the shoe in the finished structure, no point in the plane of the top bolster shall change elevation by more than 1/16 inch (1.6 mm) for the full possible travel of the rocker both ways from the neutral position nor shall the top bolster change inclination with respect to the horizontal by more than 1 degree during this same travel.

F. I-beams and girders shall be fabricated with a tolerance not greater than the following:

1. The plane of the bearing area of beams and girders shall be perpendicular to the vertical axis of the beam within 1/16 inch (1.6 mm).

2. Correction of bearing areas of shoes, beams and girders to the above tolerances shall be with heat and/or external pressure. Grinding or milling will be permitted if reduction of required thickness of member is not reduced by more than 1/16 inch (1.6 mm).

3. Rolled material must be straight before being laid off or worked.

4. If straightening is necessary, it shall be done by procedures submitted to and approved by the Engineer or designated representative. Sharp kinks and bends will be cause for rejection of the material unless corrected to the satisfaction of the Engineer or designated representative.

**721S.5 Execution**

A. Finishing

1. Finishing details of materials specified herein and Item No. 720S, unless noted otherwise, shall be in accordance with AISC 325, Steel Construction Manual, and AISC

360, Specification for Structural Steel Buildings.

2. Surface finishes shall be in accordance with ASME B46.1 and as indicated in Table A:

| TABLE A | |
|---|---|
| Condition | Roughness Value [micro inches (micrometers) |
| Member ends not subject to calculated stress | 2000 (50.8) |
| Cut surfaces 4 inches (100 mm) to 8 inches (200 mm) thick | 1500 (38.1) |
| Cut surfaces up to 4 inches (100 mm) thick | 1000 (25.4) |
| Milled ends of compression members, stiffeners, and fillers | 500 (12.7) |
| Top surfaces of steel slabs, base plates, column cap plates, and pedestal cap plates | 250 (6.4) |
| Surfaces of bearing plates intended for sliding contact, pins, and pin holes | 125 (3.2) |

3. Sheared edges of plates greater than 5/8 inch (15.9 mm) thickness and carrying calculated stress shall be planed to a depth of 1/4 inch (6.4 mm).

4. Re-entrant cuts shall be filleted to a minimum radius of 3/4 inch (19.1 mm), except for the corners of welding access cope holes adjacent to a flange.

5. Oxygen cutting shall be in accordance with AWS D1.1 and D1.5. Hand cutting shall be done only where approved by the Engineer or designated representative.

6. Edges of all main members which are sheared or oxygen cut, and all other exposed edges to be painted shall be rounded or chamfered to an approximate 1/16 inch (1.6 mm) dimension by grinding.

7. Unless otherwise indicated, steel plates for main members shall be cut and fabricated so that the primary direction of rolling is parallel to the direction of the main tensile and/or compressive stresses.

8. In all oxygen cutting, the flame shall be adjusted and manipulated to avoid cutting inside the prescribed lines. Roughness exceeding the values of Table A and occasional notches or gouges not more than 3/16 inch (4.8 mm) deep on otherwise satisfactory surfaces shall be removed by machining or grinding. Cut edges shall be left free of slag. Correction of defects shall be faired to the oxygen cut edges with a slope not exceeding 1 in 10.

9. Air carbon-arc or oxygen gouging, oxygen cutting, chipping, or grinding may be used for joint preparation or the removal of defective work or material. Oxygen gouging shall not be used on ASTM A514 (A514M), A517 (A517M), A242 (A242M), and A588 (A588M) corrosion resistant (“weathering”) steels.

10. The top and bottom surfaces of steel slabs, base plates, and cap plates of columns and pedestals shall be planed or else the steel slabs and base plates hot-straightened. Parts of members in contact with plates shall be faced to fit.

11. In planing the surfaces of expansion bearings, the cut of the tool shall be in the direction of expansion.

12. Stiffeners shall provide an even bearing against flanges. Tight-fit, when indicated, shall have at least 1 point bearing on the flange surface and the remainder with a maximum clearance of 1/16 inch (1.6 mm) at any point. Where stiffeners are to be welded to the flange, the opening prior to shall not exceed 3/16 inch (4.8 mm) with the fillet weld size increased by the amount of the opening.

13. Structural members which are indicated on the Contract Documents to be annealed or normalized shall have finish machining, boring, and straightening done subsequent to heat treatment. Normalizing and annealing shall be as defined by ASTM A941. The temperatures during the heating and cooling process shall be maintained uniformly throughout the furnace so that the temperature at any two points on the member will not differ by more than 100 F (38 C) at any one time.
14. Special requirements for ASTM A514 (A514M) and A517 (A517M) shall be as follows:

    a. Annealing and normalizing is not allowed.

    b. Stress relieve only with the approval of the Engineer or designated representative.

    c. Allowance for springback should be about three (3) times that of carbon steel.

    d. For break press forming, the lower die span should be at least sixteen (16) times the plate thickness.

    e. If steel plates to be bent are heated to a temperature greater than 1125 F (605 C), they must be requenched and tempered in accordance with the producing mill's practice.

    f. The holding temperature for stress relieving shall not exceed 1100 F (595 C), except that 950 F (510 C) shall be maximum for welds and six (6) inches surrounding welds.

15. Short radii on steel plates shall be hot bent at a temperature not greater than 1200 F (650 C).

16. When indicated, bridge shoes, pedestals, or other parts which are built up by welding sections of plate together shall be stress relieved in accordance with approved procedures.

B. Repair of Defects

1. Correction of cutting defects and of occasional notches or gouges less than 7/16 inch (11.1 mm) deep for material up to 4 inches (100 mm) thick and less than 5/8 inch (15.9 mm) for material over 4 inches (100 mm) thick may be made on steel with yield strengths up through 65 ksi (450 MPa) by welding.

2. Discontinuities or defects in plate edges which form the faces of groove welds shall be removed to a depth of 5/8 inch (15.9 mm) and repaired by welding. Laminations

opening to these edges shall be removed. Weld repairs shall be made by suitably preparing the defect, welding in accordance with AWS D1.1 (D1.1M), and grinding the completed weld smooth and flush with the adjacent surfaces.

3. Occasional notches, gouges, or defects in oxygen cut edges of ASTM A514 (A514M) and A517 (A517M) steel may be repaired by welding when approved by the Engineer or designated representative under the following conditions:

   a. Cutting defects not more than 3/16 inch (4.8 mm) deep in plate edges which will form the faces of a groove weld joint and which will subsequently be completely fused with the weld may be repaired by welding. Discontinuities or defects to these edges shall be removed to a depth of 1/4 inch (6.4 mm) below the surface by grinding or chipping and the gouge repaired by welding. Laminations opening to these edges shall be removed.

   b. Cutting defects not more than 3/16 inch (4.8 mm) deep in plate edges which will form a fillet-welded corner joint shall be repaired by welding only on the part of the edge which will become the faying surface for the joint and the fusion zone of the fillet weld. The part of the defect outside the toe of the completed fillet weld shall be removed by machining or grinding and faired to the oxygen cut surface with a slope not exceeding 1 in 10. If the actual net cross-sectional area which would remain after removal of the discontinuity is 98 percent or greater than the area of the plate based on nominal dimensions, weld repairs shall be made as specified above using E11018-M electrodes and grinding the completed weld smooth and flush with the adjacent surface to produce a proper finish.

4. Straightening Bent Material

   a. The straightening of plates, angles, miscellaneous shapes, and built up members, when approved by the Engineer or designated representative be done by methods that will not produce fracture or other damage. A detailed procedure for straightening bent materials shall be submitted to the Engineer or designated representative for approval.

   b. Straightening of individual pieces shall be done prior to assembly into a built-up member.

   c. The temperature for heat straightening of steel members shall not exceed 1200 F (650 C).

   d. Heat straightening or correction of errors in camber of ASTM A514 (A514M) and A517 (A517M) steel members shall be done only under rigidly controlled procedures, each application subject to the approval of the Engineer or designated representative. The temperature shall not exceed 1100 F (595) nor shall the temperature exceed 950 F (510) at the weld metal or within 6 inches (150 mm) thereof.

   e. The temperature of the steel shall be controlled by approved temperature indicating devices, such as crayons, liquids or bimetal thermometers.

   f. Heat shall not be applied directly on weld metal.

g. Following straightening, the metal shall be carefully inspected for evidence of fracture.

5. Pins, Pinholes, and Rockers

a. Pinholes shall be bored true to the specified diameter, smooth and straight, at right angles with the axis of the member and parallel with each other, unless otherwise indicated. Pins and pinholes shall be finished to an ASME B46.1 value of 125.

b. The diameter of the pinhole shall not exceed that of the pin by more than 1/50 inch (0.5 mm) for pins 5 inches (127 mm) or less in diameter or 1/32 inch (0.8 mm) for larger pins.

c. Rockers shall be finished to an ASME B46.1 value of 250.

6. The limits of acceptability and repair of surface imperfections for all steels shall be in accordance with ASTM A6 (A6M).

4. Discontinuities

a. Roughness exceeding an ASME B46.1 value of 2000 in oxygen cut surfaces and occasional notches or gouges not more than 3/16 inch (4.8 mm) deep on otherwise satisfactory surfaces, shall be removed by machining or grinding to a slope not exceeding 1 in 10.

b. In the determination and repair of limits of internal discontinuities visually observed on rolled, sheared or oxygen cut edges and caused by entrapped slag or refractory, deoxidation products, gas pocket or blow holes, the metal removed shall be the minimum necessary to remove the defect or to determine that the permissible limit is not exceeded. All repairs made by welding shall be approved by the Engineer and shall conform to the applicable provisions of AWS D1.1 (D1.1M).

c. The limits of acceptability and the repair of visually observed edge discontinuities in plates 4 inches (100 mm) or less in thickness shall be in accordance with Table B where the length of defect is the visible long dimension on the plate edge and the depth is the distance the defect extends into the plate from the edge.

| TABLE B | |
|---|---|
| Description of Discontinuity | Repair Required |
| Any discontinuity 1 inch (25 mm) in length or less. | None – need not be explored. |
| Any discontinuity over 1 inch (25mm) in length and 1/8 inch (3.2 mm) maximum depth. | None – depth should be explored. |
| Any discontinuity over 1 inch (25 mm) in length with depth over 1/8 inch (3.2 mm) but not greater than 1/4 inch (6.4 mm). | Remove – need not weld. |
| Any discontinuity over 1 inch (25 mm) in length with depth over 1/4 inch (6.4 mm) | Completely remove and weld. Aggregate length of welding not over 20 |

| | |
|---|---|
| but not greater than 1 inch (25 mm). | percent of plate edge length being repaired. |
| Any discontinuity over 1 inch (25 mm) in length with depth greater than 1 inch (25 mm). | Subject to approval by the Engineer. Gouge out to 1 inch (25 mm) and block off by welding. Aggregate length of welding not over 20 percent of plate edge length being repaired unless approved by the Engineer. |

d. Removal of metal by gouging shall be done in a manner assuring adequate width and slope for welding.

e. Multiple discontinuities should be considered continuous when located in the same plane within 5 percent of the plate thickness and separated by a distance less than the length of the smaller of two adjacent continuities.

C. Heat Curving

The Contractor shall submit a list of steel members proposed for heat curving and a detailed procedure for this work to be completed. Heat curving shall not proceed prior to written approval by the Engineer or designated representative.

D. Color Coding

1. For each steel approved for use on the project, a distinct color code shall be required. The color code shall be as specified in ASTM A6 (A6M). White shall be required for A36 steel.

2. The color code used for any steels not specified by ASTM A6 (A6M) must be submitted to and approved by the Engineer or designated representative.

3. The appropriate color(s) shall be placed on the material upon entry into the shop and shall be carried on all pieces to final fabrication. Loss of color code marking on any piece and with no other positive identification shall require testing thereof prior to its use to re-establish positive identity of the material to the satisfaction of the Engineer or designated representative.

E. Shop Painting

Preparation of surfaces and shop painting shall conform to Item No. 722S, "Paint and Painting".

F. Marking and Shipping

1. All structural members shall be marked in accordance with the erection diagram.

2. The markings shall be over the painted surface. In no case shall shop paint be left off in

order to preserve original markings on steel to be painted.

3. Members weighing more than 3 tons (2.7 MT) shall have the weight marked thereon.

4. The loading, transporting, unloading, and storing of material shall be conducted so it will be kept clean and free from injury.

5. Bolts of each length and diameter and loose nuts or washers of each size, shall be packed separately and shipped in boxes, crates, kegs or barrels. A list and description of the contents shall be plainly marked on the outside of each package.

**721S.6 Bolted Members**

A. Detailing

Detailing of bolted connections, where not indicated on the drawings or specified herein, shall conform to the latest edition of AISC 325, Steel Construction Manual.

B. Bolts

Bolts shall be in accordance with Item No. 720S, "Metal for Structures".

C. Bolt Holes

1. All holes for bolts shall be either punched or drilled. Material forming parts of a member composed of not more than five (5) thicknesses of metal may be punched 1/16 inch (1.6 mm) larger than the nominal diameter of the bolts, if the thickness of the metal is not greater than 3/4 inch for carbon steel, 5/8 inch (16.9 mm) for HS or 1/2 inch (12.7 mm) for XHS steel. For more than five (5) thicknesses or when any of the main material is thicker than shown herein, all the holes shall be subpunched or subdrilled 3/16 inch (4.8 mm) smaller and after assembling, reamed 1/16 inch (1.6 mm) larger or drilled from the solid to 1/16 inch (1.6 mm) larger than the nominal diameter of the bolts.

2. For punched holes, the diameter of the die shall not exceed that of the punch by more than 1/16 inch (1.6 mm). If any holes must be enlarged to admit the bolts, they shall be reamed. Holes shall be clean cut without torn or ragged edges. Poor matching of holes will be cause for rejection.

3. Reamed, punched, and drilled holes shall be cylindrical, perpendicular to the member, and 1/16 inch (1.6 mm) larger than the nominal diameter of the bolts. Reamers and drills shall be guided by mechanical means. Only holes which are not accessible to mechanically guided equipment shall be done by hand. Reaming and drilling shall be done with twist drills, except that for poorly aligned holes tapered reamers shall be used in conjunction with a template so placed and held so as to force the reaming to the best center of holes for that group. Connecting parts shall be assembled and held securely during reaming or drilling operations and match-marked before disassembling.

D. Preparation of Holes for Field Bolting

1. Holes in all field splices of main truss members, box girders, continuous I-beams, and plate girders shall be subpunched and reamed while assembled or drilled full size with all parts assembled, taking into account their relative position in the finished structure

due to grade, camber, and curvature. The assembly, including camber, alignment, accuracy of holes, and milled joints shall be approved by the Engineer or designated representative before reaming or drilling full size is started.

2. All holes for floor beams and stringer end connections shall be subpunched and reamed to a steel template of not less than 1 inch (25 mm) thickness or reamed while assembled.

3. Holes for secondary members such as diaphragms, laterals, sway bracing, etc. may be punched full size unless subpunching or subdrilling.

E. Accuracy of Holes

1. Accuracy of all holes punched full size, subpunched, or subdrilled shall be such that a cylindrical pin 1/8 inch (3.2 mm) smaller in diameter than the nominal size of the punched hole may be entered perpendicular to the face of the member, without drifting, in at least 75 percent of the adjoining holes in the same plane after assembling and prior to any reaming. Pieces not meeting this requirement will be rejected. Any hole which will not pass a pin 3/16 inch (4.8 mm) smaller in diameter than the nominal size of the punched hole will be cause for rejection.

2. After reaming or drilling, 85 percent of the holes in any adjoining group shall show no offset greater than 1/32 inch (0.8 mm) between adjacent thickness of metal.

3. Layout of shop work shall be done so that gage lines for bolts shall not vary from plan dimensions more than 1/16 inch (1.6 mm). Full size holes in any adjoining group or line shall not vary more than the following:

   a. At least 8 percent of the holes shall be within 1/16 inch (1.6 mm) of plan gage.

   b. Not more than 10 percent of the holes may vary as much as 1/8 inch (3.2 mm) from plan gage.

   c. Holes varying more than 1/8 inch (3.2 mm) from plan gage will not be accepted.

F. Shop Assembly

1. Each truss or box girder section shall be assembled in its relative position in the shop before reaming is started. Match-marks shall be stamped in the metal at all field connections, conforming to erection diagrams, at the time reaming is done.

2. Surfaces of metal to be in contact shall be cleaned before assembling.

3. Disassembling after reaming will be required to remove shavings, burrs, etc.

4. When bolting is required, shop or field, faying surfaces of all joints, including splice plates, shall be cleaned in accordance with AISC 325, Steel Construction Manual, and AISC 360, Specification for Structural Steel Buildings.

5. The members shall be free from twists, bends, and other deformations. In no case shall tack welding be used in assembly for bolting without prior approval of the Engineer or

designated representative.

6. If necessary, the bolt holes shall be spear-reamed for the admission of bolts preparatory to the shop bolting of full-sized punched material. The spear reamer used for this purpose shall be not more than 1/16 inch (1.6 mm) larger than the nominal diameter of the bolts.

7. Parts not completely bolted in the shop shall be secured by temporary bolts, where practicable, to prevent damage in shipment and handling.

8. The drifting done during assembling shall be only that required to bring the parts into position and not sufficient to enlarge the holes or distort the metal. If any holes must be enlarged to admit bolts, they shall be reamed.

G. Preparation and Fit of Members

1. When indicated, abutting joints shall be milled and brought to an even bearing. Where joints are not milled, the openings shall not exceed 1/4 inch (6.4 mm).

2. Floor beams and girders with end connection angles shall be built to exact length back to back of connection angles. If end connections are faced, the finished thickness of the angles shall be not less than that indicated.

**721S.7 Welded Members**

A. General

1. All welding operations, processes, equipment, materials, qualifications of welders, quality of work, nondestructive testing, and inspection shall conform to Item No. 723S – “Structural Welding”, AWS D1.1 (D1.1M), AWS D1.5 (D1.5M), and the Shop Drawings.

2. Unless otherwise indicated, nondestructive testing (magnetic particle and radiographic) required in the shop will be done by, and at the expense of, the Contractor. This will include furnishing all materials, equipment, tools, labor and incidentals necessary to perform the required testing.

3. All magnetic particle inspection and all radiographic inspection shall be done in the presence of and at the locations selected by the Engineer or designated representative. The Engineer or designated representative shall examine and interpret all tests made.

4. Magnetic particle inspection shall conform to ASTM E709 and the following unless otherwise indicated:

   a. For built-up members, 100 percent of the web to flange and bearing stiffener fillet welds on not less than 1 fabricated piece for each 15 pieces or fraction thereof when the maximum flange thickness is less than 2 1/2 inches (63.5 mm).

   b. For built-up members, 100 percent of the web to flange and bearing stiffener fillet welds on not less than 1 fabricated piece for each 10 pieces or fraction thereof when the maximum flange thickness is 2 1/2 inches (63.5 mm) or greater.

c. Welds requiring repairs shall be retested by magnetic particle inspection after the repairs are made.

d. No magnetic particle inspection will be required for rolled sections.

5. Radiographic inspection shall conform to ASTM E94, AWS B1.10, and the following unless indicated otherwise on the Drawings:

a. For shop welds of material 65 ksi (450 MPa) yield strength and less, radiographic inspection will be made as follows:

1) The full flange width of 35 percent of all flange splices where the plate thickness at the weld is 2 inches (50 mm) or less.

2) The full flange width of 50 percent of all flange splices where the plate thickness at the weld is greater than 2 inches (50 mm).

3) 1/5 the depth of the web of 50 percent of the web splices on each structure.

4) If unacceptable work is found, additional radiographs will be made on sections welded by the same equipment and/or operator just prior to and just after the section containing the defect.

b. For shop welds of material greater than 65 ksi (450 MPa) yield strength, radiographic inspection shall be made on all groove welds. These welds shall be inspected not less than 48 hours after they are completed.

c. Welds requiring repairs shall be retested by radiography after repairs are made. All radiographic inspection and necessary repairs shall be done prior to assembly.

d. When radiographic inspection of particular welds is required by the plans, this shall be in addition to the radiographic inspection required herein.

B. Surface Preparation for Welding

1. Surfaces to be welded shall be smooth, uniform, and free from fins, tears, and other defects which would adversely affect the quality of the weld. Surfaces to be welded shall be free from loose scale, slag, rust, grease, or other material. Mill scale that withstands vigorous wire brushing or a light film of drying oil or rust inhibitive coating may remain. Finish of bevels of groove welds shall be milled or ground. Oxygen cut bevels without grinding will not be allowed.

2. When a zinc-rich paint is specified, surfaces within 4 inches (100 mm) of a groove weld joining main stress carrying members and within 2 inches (50 mm) of fillet welds joining diaphragms or lateral bracing to stiffeners or gusset plates shall be sandblast cleaned and coated with linseed oil. After welding is completed, the areas shall be sandblast cleaned and painted as required for the specified paint system.

3. For other paint systems, surfaces within 2 inches (50 mm) of any weld joining main stress carrying members shall be free from any paint or other material that would prevent proper welding.

4. Sheared plates for webs of built-up members shall be wide enough to allow for trimming of edges where built-in camber is required. Plates with rolled edges used for webs shall be trimmed by oxygen cutting.

5. The faying surfaces of the web and flange plates and the adjacent surfaces that are to be fillet welded shall be cleaned by grinding prior to assembly and welding of web to flange.

C. Assembly of Parts

1. Parts to be joined by fillet welds shall be brought into as close contact as possible, with a maximum separation of 3/16 inch (4.8 mm). If the separation is 1/16 (1.6 mm) inch or greater, the leg of the fillet weld shall be increased by an equivalent amount. The separation between faying surfaces of lap joints and of butt joints landing on a backing strip shall not exceed 1/16 inch (1.6 mm). The fit of joints not sealed by welds throughout their length shall be close enough to exclude water after painting. Where irregularities in rolled shapes or plates after straightening prevents this, the procedure necessary to bring them within the above limits shall be approved by the Engineer or designated representative. The use of fillers is prohibited, except as indicated or as approved by the Engineer.

2. Members to be welded shall be brought into correct alignment and held in position by clamping, welding, or tacking until the joint has been welded.

3. Adequate clamps must be provided to prevent cupping or warping of the parts when welding them to the web. The clamping devices must be designed to not interfere with the operation or guiding of automatic welding equipment.

4. Temporary stiffeners used for jigs and/or warpage control shall not be tack welded to the flange material. Tacking to the web is permissible if the welds are at least d/6 distance away from the flange, where "d" is the web depth. The tack weld shall be removed by grinding flush with the parent metal prior to acceptance.

5. Suitable allowance shall be made for shrinkage. The joint shall never be restrained on both sides when welding.

6. Abutting parts to be joined by groove welds shall be aligned carefully. All shop groove welds in flange plates shall be ground smooth and flush with the base metal on all surfaces. This shall apply both to parts of equal thickness and parts of unequal thickness.

7. The surfaces shall be ground so that the radii at the points of transition will be 4 inches (100 mm) minimum.

8. When groove welds are used to join materials of different thickness or width, there shall be a smooth transition between offset surfaces with a slope of not greater than 1 in 4 in

thickness transition and to the proper radii in the case of width transition.

9. Groove welds in web plates need not be ground unless indicated.

10. Grinding shall be done in the direction of stress and in a manner that keeps the metal below the blue brittle range of 350 F (177 C).

11. Intermediate stiffeners within 12 inches (300 mm) of a splice point shall be shipped tack welded in place. Final welding shall be done in the field.

D. Surface Preparation and Shop Assembly for Field Welds

1. Ends of beams and girders shall be prepared in accordance with the requirements herein or as indicated. The centerline of the land of opposing web and flange bevels shall not deviate from each other by more than 1/16 inch.

2. For Shop Assembly, members should be brought into abutting contact in accordance with the shop drawings . Root faces shall not vary in excess of 1/16 inch (1.6 mm) from contact. Corrections by additional cutting and/or grinding shall be made to bring the splice within this tolerance. Finish of bevels for groove welds shall be milled or ground. Oxygen cut bevels without grinding will not be allowed.

3. Ends of beams or girders to be welded shall be prepared in the shop taking into account their relative positions in the finished structure due to grade, camber, and curvature. Each splice shall be completely shop assembled, checked and match-marked while assembled.

## 721S.8 Field Erection

A. General

1. Field erection shall be in accordance with the approved shop drawings. Such approval shall not relieve the Contractor of responsibility for the safety or adequacy of methods or equipment or from carrying out the work in full as indicated. No work shall be done without the approval of the Engineer or designated representative.

2. Field erection plans for I-beam units will not be required unless indicated.

3. Spot welding for the purpose of eliminating field erection bolts or for holding steel parts together while bolting will not be permitted.

4. The Contractor shall provide falsework and all tools, machinery, and appliances (including drift pins and fit-up bolts) necessary for the expeditious handling of field erection work. Drift pins sufficient to fill at least 1/4 of the field holes for main connections shall be provided.

5. When railroad or roadway traffic must be maintained beneath girders or beams already placed, traffic shall be protected against falling objects during the erection of diaphragms

and other structural members, during the placing of cast-in-place concrete, and during the erection and dismantling of forms thereof. The protection shall consist of safety nets of 1 inch (25 mm) mesh maximum or a flooring with openings not larger than 1 inch (25 mm).

B. Storing, Handling, and Assembling Materials

1. All material shall be handled in a manner that prevents damage.

2. Stored material shall be placed on skids above the ground and kept clean and properly drained. Girders and beams shall be placed upright and shored. Long members, such as columns, shall be supported on skids placed closely enough to prevent excessive deflection.

3. The parts shall be match-marked and assembled accurately as indicated on the approved erection drawings

4. Hammering which will injure or distort the members is not allowed.

5. All bearing and faying surfaces of structural steel in bolted connections shall be cleaned before the connection members are assembled. When ASTM A588 (A588M) steel is used these, surfaces shall receive a Class B blast cleaning conforming to Item No. 722S, "Paint and Painting", prior to assembly of the connection members. The areas of the outside ply under washers, nuts, or bolt heads shall be cleaned prior to installation of the bolts.

6. Unless erected by the cantilever method, truss spans shall be erected on blocking located so as to provide proper camber. The blocking shall be left in place until the tension chord splices are fully connected and all other truss connections pinned and bolted. Main connections shall have 1/2 of the holes filled with bolts and erection pins (1/2 bolts and 1/2 pins) before swinging the span. Splices and connections carrying traffic during erection shall have 3/4 of the holes so filled.

7. Fit-up bolts shall be of the same nominal diameter as the connection bolts. Erection pins shall be 1/32 inch (1 mm) larger diameter.

8. There shall be no temporary welds for transportation, erection, or other purposes on main members, except at approved locations more than 1/6 the depth of the web from the flanges of beams and girders, unless otherwise approved by the Engineer or designated representative.

C. Falsework

1. Falsework shall be properly designed for the loads to be supported and shall be substantially constructed and properly maintained. The Contractor shall prepare and submit to the Engineer falsework plans, including calculations.

2. The falsework plans shall include all details of members, connections, equipment, etc., so that a structural check can be made of them.

3. Approval of the falsework plans does not relieve the Contractor of responsibility/liability

for the falsework during field erection.

D. Welding and Nondestructive Testing

Welding and nondestructive testing shall conform to Item No. 723S, “Structural Welding".

E. Ancillary Items

All ancillary items such as castings, bearing plates, etc. shall be in accordance with the drawings or as specified elsewhere.

F. Errors in Shop Work

1. Any errors in shop work which prevent the proper assembling and fit-up of parts by the moderate use of drift pins or a moderate amount of reaming and slight chipping or cutting shall be reported immediately to the Engineer or designated representative, along with the proposed method(s) of correction.

2. Corrections of minor misfits and a reasonable amount of reaming will be considered a legitimate part of the work.

3. Corrections shall be made in the presence of the Engineer or designated representative, unless otherwise directed. Such work is to be done at the entire expense of the Contractor.

**721S.9 Paint and Painting**

Unless otherwise indicated, painting shall conform to Item No. 722S, "Paint and Painting".

**721S.10 Measurement and Payment**

No direct compensation will be made for "Steel Structures". Measurement and payment for quantities of metals, concrete, reinforcement, railing, ancillary items, and other bid items which constitute the completed and accepted structure(s) shall conform to pertinent specifications.

**End**

| SPECIFIC Cross Reference Materials |
|---|
| Specification Item 721S, "Steel Structures" |

City of Austin Standard Specification Items

| Designation | Description |
|---|---|
| Item 406S | Reinforcing Steel |
| Item 720S | Metal for Structure |
| Item 722S | Paint and Painting |
| Item 723 | Structural Welding |

American Institute of Steel Construction (AISC)

| Designation | Description |
|---|---|
| 325 | Steel Construction Manual |
| 360 | Specification for Structural Steel Buildings |

American Society for Testing and Materials (ASTM)

| Designation | Description |
|---|---|
| A6/A6m | Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling |
| A242/A242M | Standard Specification for High-Strength Low-Alloy Structural Steel |
| A588/A588M | Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi [345 MPa] Minimum Yield Point to 4-in. [100-mm] Thick |
| A941 | Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys |
| E94 | Standard Guide for Radiographic Examination |
| E709 | Standard Guide for Magnetic Particle Examination |

American Society of Mechanical Engineers (ASME)

| Designation | Description |
|---|---|
| B46.1 | Surface Texture (Surface Roughness, Waviness & Lay) |

American Welding Society (AWS)

| Designation | Description |
|---|---|
| B1.10 | Guide for Nondestructive Inspection of Welds |
| D1.1/D1.1M | Structural Welding Code – Steel |
| D1.5/D1.5M | Bridge Welding Code |

| RELATED Cross Reference Materials |
|---|
| Specification Item 721S, "Steel Structures" |

City of Austin Standard Specification Items

| Designation | Description |
|---|---|
| Item 406S | Reinforcing Steel |

TxDOT Specifications

| Designation | Description |
|---|---|
| Item 441 | Steel Structures |
| Item 442 | Metal for Structures |
| Item 447 | Structural Bolting |
| Item 448 | Structural Field Welding |

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**Item No. 723**
**Structural Welding**

## 723.1 Description

This item shall consist of field welding of structural steel and reinforcing steel.

Provisions are made herein for the welding of the types of steel listed in Table 2, using the manual shielded metal-arc process, semiautomatic (manual) gas metal-arc welding and flux cored arc welding processes. Other welding processes may be permitted with the specific approval of the Engineer and with qualification of the welding procedure.

Shop fabrication and welding shall conform to Item No. 721, "Steel Structures" and TXDOT Bulletin C-5.

## 723.2 General

All welds including tack welds to be incorporated shall be made by a certified welder. Tack welds shall be cleaned and fused thoroughly with the final weld. Defective, cracked or broken tack welds shall be removed.

Certification for welders shall conform to TXDOT Bulletin C-6. Miscellaneous welds may be made by a welder qualified conforming to "Welder Qualification", below.

Welds shall be as indicated. The location or size shall not be changed without approval of the Engineer.

The welder shall identify groove welds made by the welder with paint or indelible ink.

Welding will not be allowed when air temperature is lower than 20 F, surfaces are wet or exposed to rain, snow or wind or when operators are exposed to inclement conditions that will hamper their performance.

Moisture present at the point of welding shall be driven off conforming with Table 3, before welding commences. Wind breaks shall be required for the protection of all welding operations.

There shall be no temporary welds for transportation, erection or other purposes on main members, except at locations more than 1/6 the depth of the web from the flanges of beams and girders as indicated or as approved by the Engineer.

ASTM A 514/517 steels shall maintain all groove welds in main members and in flanges of beams and girders subject to tensile stress or reversals of stress shall be finished smooth and flush on all surfaces, including edges, by grinding in the direction of applied stress leaving the surface free from depressions. Chipping may be used provided it is followed by such grinding. Parts joined by groove welds connecting plates of unequal thickness or width shall have a smooth transition between offset surfaces at a slope not greater than 1 in 4 with the surface of either part. The surfaces shall be ground so that the radii at the points of transition shall be 4 inches minimum.

All groove welds, except when produced with the aid of backing, shall have the root of the initial weld gouged, chipped or other-wise removed to sound metal before welding

is started from the second side, except that back gouging will not be required when welding steel piling or armor joints with E 6010 electrodes. The back side shall be thoroughly cleaned before placing backup pass.

When backing for welds is left in place to become a part of the structure, it shall be a single length insofar as possible. Where more than a single length is needed, they shall be joined by full penetration butt welds. The surfaces of this butt weld shall be ground flush as necessary to obtain proper fit-up in the weld joint.

Before welding over previously deposited metal, all slag shall be removed and the weld and adjacent base metal shall be cleaned. This requirement shall apply equally to successive layers, successive beads and the crater area.

Arc strikes outside the area of permanent weld must be avoided on all steels. Where they do occur, resulting cracks and blemishes shall be ground out to a smooth contour and checked to insure soundness.

Stringer bead technique shall be used where possible for groove welds on all types of steel. Weaving will not be permitted for ASTM A 514/517 steel except in vertical welding, where a weave not exceeding 2 electrode diameters is permissible for manual shielded metal-arc process.

In all welding processes the progression for all passes in vertical welding shall be upward using a back step sequence.

Groove welds shall begin and terminate at the ends of a joint on extension bars. Edge preparation and thickness of extension bars shall be the same as that of the member being welded and shall extend a minimum of 3/4 inch beyond the joint. Extension bars shall be removed with a cutting torch or arc-air gouging upon completion of the weld and the flange edges shall be ground smooth.

Any defects exposed by the grinding shall be cleaned, filled with weld metal and reground to a uniform finish. All grinding shall be parallel to the flange. Excess grinding of the parent metal shall be avoided.

**723.3 Materials**

Electrodes for manual shielded metal arc welding shall conform to the requirements of the latest edition of "Specification for Mild Steel Covered Arc-Welding Electrodes", AWS A5.1 or to the requirements of the latest edition of "Specifications for Low Alloy Steel Covered Arc-Welding Electrodes", ASW A5.5.

All electrodes and combination of electrode shielding for gas metal-arc welding for producing weld metal with a minimum specified yield point not exceeding 60,000 psi shall conform to the requirements in the latest edition, "Specification for Mild Steel Electrodes for Gas Metal-Arc Welding", AWS A5.18, AWS A5.28 or "Specification for Mild Steel Electrodes for Flux Cored Arc Welding", AWS A5.20, applicable for the classifications producing weld metal having a minimum impact strength of 20 ft/lb, Charpy V-notch, at a temperature of 0 F or below.

For weld metal with a minimum specified yield strength exceeding 60,000 psi, the Contractor shall demonstrate that each electrode and flux or combination of electrode and shielding medium proposed for use will produce low alloy weld metal having the mechanical properties listed in Table 1 in the as welded condition.

The mechanical properties shall be determined from a multiple pass weld made in accordance with the test requirements of the latest edition of AWS A5.18, AWS A5.20 or AWS A5.28 as applicable.

**Table 1: Required Mechanical Properties for GMAW and FCAW Electrodes**

| | | Tensile Strength | Yield Strength | Elongation, | Strength |
|---|---|---|---|---|---|
| **GMAW** | **FCAW** | **psi -** | **psi -** | **% in 2 inches** | **ft-lb at 0 F -** |
| **Grade** | **Grade** | **Minimum** | **Minimum** | **Minimum** | **Minimum** |
| ER80S | E80T | 80,000 | 65,000 | 18 | 20 |
| ER90S | E90T | 90,000 | 78,000 | 17 | 20 |
| ER100S | E100T | 100,000 | 90,000 | 16 | 20 |
| ER110S | E110T | 110,000 | 98,000 | 15 | 20 |

The mechanical property tests for Grades ER100S, E100T and E110T shall be made using ASTM A 514/517 base metal.

All electrodes used on City projects shall be approved by the Engineer.Tests shall be made on electrodes of the same class, size and brand which were manufactured by the same process and with the same materials as the electrodes to be furnished. Tests must be made and approval renewed every 12 months.

For sizes of electrodes not requiring tests by AWS Specifications, test reports shall be furnished for electrodes of the nearest size and of the same classification. The request for approval shall include the manufacturer's certification that the process and material requirements were the same for manufacturing the tested electrodes and those to be furnished and new test reports, shall be submitted if any changes are made in process or materials during the effective period.

Class of electrodes required will be shown in Table 2. Electrodes shall be used with the type of current, the polarity and in the positions permitted by AWS A5.1 and A5.5 for manual shielded metal-arc welding. AWS A5.18 or A5.20 and A5.28 Specifications shall govern for gas metal-arc welding and flux cored arc welding.

| Table 2: Classifications of Electrodes Permitted | | | | | |
|---|---|---|---|---|---|
| **Type of Steel** | **Main Members Groove & Fillet Welds** | | | **Secondary Members Groove & Fillet Welds** | |
| Steel Piling, | E6010 | E60T-8 | E60XX | E60T-8 | ER70S-2 |
| A 53 Pipe, | E6011 | E70S-1B | E70XX | E7XT-1 | ER70S-3 |
| A 500, | E7016 | ER70S-2 | E702-1B | E7XT-5 | ER70S-6 |
| A 501, | E7018 | ER70S-3 | E70S-2 | E7XT-6 | ER70S-7 |
| Armor Joints | | ER70S-6 | E70S-3 | E7XT-8 | |
| | | ER70S-7 | E70S-6 | | |
| | | | E70U-1 | | |
| A 36, | E7016 | ER70S-2 | E7016 | ER70S-2 | |
| A 441, | E7018 | ER70S-3 | E7018 | ER70S-3 | |
| A 572 Grade 50 | E7XT-1 | ER70S-6 | E7XT-1 | ER70S-6 | |
| A 588, | E7XT-5 | ER70S-7 | E7XT-5 | ER70S-7 | |
| A 242 Deck Plates | E7XT-6 | | E7Xt-6 | | |
| API Pipe | E7XT-8 | | E7XT-8 | | |
| A 514/A 517 | E10018M | ER1102 | E11018M | ER110S | |
| 2 1/2 inches thick or less | E110T | | E110T | | |
| A 514/A 517 | E10018M | ER100S | E10018M | ER100S | |
| Over 2 1/2 inches thick | E100T | | E100T | | |
| A 588, A 242, | E8018,C-3 | | E8018,C-3 | | |
| A 618 Weathering Steel | E80T(3) | ER80S(3) | E80T(3) ER80S(3) | | |
| Reinforcing Steel | E7016 | E7018 | | | |
| A 572 Grades 60 and 65 for Light Towers | E8016 E8018 | E80T ER80S | | | |

**(1)** Use of the same type electrode with the next higher mechanical properties, conforming to AWS A5.1 or A5.5, than those listed will be permitted.

**(2)** In joints involving base metals of different yield points or strengths, low hydrogen electrodes applicable to the lower strength base metal may be used.

**(3)** Deposited weld metal for weathering steel shall have the following chemical composition: C, maximum percent, 0.12; Minimum percent, 0.51/1.30; P, maximum percent, 0.03; S, maximum percent, 0.04; Si, percent 0.35/0.80; Cu, per-cent, 0.30/0.75; Ni, percent, 0.40/0.80; Cr, percent, 0.45/0.70.

Before use, all electrodes with low hydrogen coverings conforming to AWS A5.1 shall be dried for not less than 2 hours between 450 F and 500 F and electrodes with low hydrogen coverings conforming to AWS 5.5 for not less than 1 hour at a temperature between 700 F and 800 F. Immediately after drying, electrodes shall be stored in ovens

held at a temperature of at least 250 F. E70 electrodes not used within 4 hours, E80 within 2 hours, E90 within 1 hour, E100 and E110 within 30 minutes after removal from the storage oven shall be redried before use. Electrodes with flux which has been wet, cracked or otherwise damaged, shall not be used. When ASTM A 514/517 steel is used for welding, electrodes shall be dried at least 1 hour at temperatures between 700 F and 800 F before being used. Electrodes may be redried only once.

Suitable facilities for drying and storage of electrodes shall be furnished at the job site, along with thermometers for checking and controlling the oven temperature.

In humid atmospheres, the times allowed for use without redrying may be reduced.

When a gas or gas mixture is used for gas metal-arc or flux cored arc welding, it shall be of a welding grade having a dew point of -40 F or lower. The gas manufacturer shall furnish certification to the Engineer that the gas or gas mixture is suitable for the intended application and will meet the dew point requirements.

Welding wire coils removed from the original package shall be protected or stored to keep their characteristics or welding proper-ties intact. Rusty coils or portions of coils that are rusty shall not be used.

Any deviation from the above electrode designation shall be approved by the Engineer.

### 723.4 Construction Methods

For any welding process, the parts to be joined by fillet welds shall be brought into as close as possible and shall not be separated more than 3/16 inch. If the separation is 1/16 inch or greater, the leg of the fillet weld shall be increased by the amount of the separation. The separation between faying surfaces of lap joints and of butt joints landing on backing strips shall not exceed 1/16 inch.

Splices of beams and girders joined by groove welds shall be carefully aligned with the center of gravity of both members coinciding or each flange vertically offset equally. Beams and girders with offset webs shall be fit with the webs aligned and the flanges offset laterally.

When flanges are offset or abutting parts differ a thickness or width by more than 1/8 inch, the joint shall be made with the slope of the weld metal to each surface, with a transition not exceeding 1 in 4.

Suitable allowance shall be made for shrinkage and the joint shall never be restrained on both sides in any welding process.

All butt splices shall be made before welding of diaframs or sway bracing in a particular section of a unit. Diaframs and sway bracing may be welded in a unit behind the splice welding to provide stability except where such welding interferes with butt splice adjustments such as at a drop-in segment of a continuous unit. All splices shall be made before welding of beams or girders to shoes.

For manual shielded metal-arc welding, the fit-up procedure listed below shall be used for manual shielded metal-arc welding of groove welds for butt joints:

Members shall be spaced to provide a 3/16 inch root opening at the nearest point. When at other parts of the joint the spacing provides up to and including a 7/16 inch opening correction may be made by buildup not exceeding 1/8 inch on each bevel nose. Openings exceeding 7/16 inch shall require rebeveling of the joint to bring it within the maximum buildup limits prescribed above. Build must be allowed to cool before proceeding with the welding.

All members shall be brought into correct alignment and held in position by acceptable clamps while being welded.

Deviations from the above fit-up procedure shall be approved by the Engineer.

**723.5 Procedure**

Shrinkage and distortion shall be controlled through the use of an approved procedure. Passes shall be made symmetrically and shall alternate between both sides of the joint.

For manual shielded metal-arc welding, beam and girder splices shall be made as indicated. Welds shall be alternated from side to side to prevent heat buildups on 1 flange edge. The passes must be arranged between the top and bottom flange to maintain balance and symmetry.

The sequence used in welding of splices in all I-beams shall be to first place 4 tacks (1 1/2 to 2 inches) in the web.

For I-beam or for built-up girders, place passes 1, 2 and 3 in the top flange, followed by passes 4, 5 and 6 in the bottom flange.

Gouge out and replace passes 1 and 4, which always are placed in the over position before welding on the web. Next, place passes 7 and 8 in the web after aligning girder webs with short tacks at approximately 8 inches on centers.

Alignment clamps may be removed when sufficient weld has been placed to hold the members together and welding is completed using the sequence indicated.

When welding the root passes of beam and girder splices, E7010 electrodes may be used, provided the work is preheated conforming to Table 3. After the root passes are backed up, the E7010 electrode pass shall be completely removed by arc-air gouging and replaced using low hydrogen electrode.

When this procedure is used, it shall be a continuous operation and back gouging and rewelding shall be completed on each splice before starting on another one. The use of E7010 electrodes will not be permitted for welding ASTM A 514/A 517 steel.

For haunch girder splices adjacent to the haunch section, the welding, once started, shall be continuous until a minimum of 50 percent of the welding in both flanges is completed.

Deviation from the above sequence of weld passes shall be approved by the Engineer.

Procedures for all gas metal-arc and flux cored arc welding shall be submitted to the Engineer for approval and shall be qualified prior to any field welding.

All gas metal-arc and flux cored arc welding procedures shall be qualified conforming to Sections 5 and 7 of TXDOT Bulletin C-5. For each joint to be used in construction, the joint details, electrode classification or grade, electrode diameter, voltage, amperage, travel speed, order and relative position of passes, number and thickness of layers, gas flow, dew point of gas, back gouging, method of cleaning and other pertinent information shall be clearly presented in the Procedure Specification. Fillet welds shall conform to details indicated.

Procedures for welding on ASTM A 514/A 517 steel shall be qualified conforming to TXDOT Bulletin C-5 and approved by the En-gineer prior to starting work. Variables to be reported shall include welding process, plate thickness, grade of steel, weld position, joint details, type and size of electrode, number and location of passes, welding sequence, back gouging, current and voltage per pass, welding speed, heat, input and maximum interpass temperature. The heat input and maximum interpass temperature shall not exceed the recommendations of the Steel Producer.

The classification and size of electrode, arc length, voltage and amperage shall be suitable for the thickness of the material, type of groove, welding positions and other circumstances attending the work.

**(1) Manual Shielded Metal-Arc Welding Process**

(a) The maximum size of electrode shall be as follows provided the welder has been certified for its use by the City:

1. 5/16 inch for all welds made in the flat position except root passes.
2. 1/4 inch for horizontal fillet welds.
3. 1/4 inch for root passes of fillet welds made in the flat position and of groove welds made in the flat position with backing and with a root opening of 1/4 inch or more.
4. 5/32 inch for welds made with EXX14 and low hydrogen electrodes in the vertical and overhead positions.
5. 3/16 inch for root passes of groove welds and for all other welds not included under 1, 2, 3 and 4 above.

(b) The root pass size shall be large enough to prevent cracking. The maximum thickness of layers subsequent to the root pass in fillet welds and of all layers in groove welds shall be:

1. 1/4 inch for root passes of groove welds.
2. 1/8 inch for subsequent layers of welds made in the flat position.
3. 3/16 inch for subsequent layers of welds made in the vertical, overhead and horizontal positions.

(c) The maximum size fillet weld which may be made in one pass shall be:

1. 3/8 inch in the flat position.
2. 5/16 inch in horizontal or overhead positions.
3. 1/2 inch in the vertical position.

**(2) Manual (Semiautomatic) Gas Metal-Arc Welding and Flux Cored Arc Welding Process**

(a) The maximum size electrode used shall be as follows:

1. 5/32 inch for the flat and horizontal positions.
2. 3/32 inch for the vertical position.
3. 5/64 inch for the overhead positions.

(b) The thickness of weld layers, except root and surface layers shall not exceed 1/4 inch. When the root opening of a groove weld is 1/2 inch or greater, a multiple pass split-layer technique shall be used. The split-layer technique shall be used. The split-layer technique shall be used in making all multiple pass welds when the width of the layer exceeds 5/8 inch for gas metal-arc welding or 3/4 inch for flux cored arc welding.

(c) The welding current, arc voltage, gas flow, mode of metal transfer and speed of travel shall be such that each pass will have complete fusion with adjacent base metal and weld metal and there will be no overlap, excessive porosity or undercutting.

(d) Gas metal-arc welding or flux cored arc welding with external gas shielding shall not be done in a draft or wind. An approved shelter of a material and shape capable of reducing the wind velocity in the vicinity of the welding to a maximum of 5 miles per hour shall be furnished by the Contractor

(e) The maximum size of a fillet weld made in 1 pass shall be:

1. 1/2 inch for the flat and vertical position.
2. 3/8 inch for the horizontal position.
3. 5/16 inch for the overhead position.

**(3) Preheat**

Preheat ahead of welding both groove and fillet welds (including tack welding) will be required as shown in Table 3.

Preheat and interpass temperatures must be sufficient to prevent crack formation. The preheat temperatures shown in Table 3 are minimums and higher preheats may be necessary in highly restrained welds.

When the base metal is below the required temperature, it shall be preheated so the parts being welded are not less than the specified temperature within 3 inches of the point of welding.

For all groove welds, reheat temperature shall be measured on the side opposite to which the heat is applied at points about 3 inches away from the joint.

Preheating equipment shall be adequate to maintain the entire joint at or above the specified temperature. When possible, a joint shall be completely welded before it is allowed to cool below the specified temperature but shall always be welded sufficiently to prevent cracking before cooling is permitted.

Usually preheat and interpass temperatures shall not exceed 400 F for thickness up to 11/2 inches and 450 F for greater thickness. These temperatures shall never be exceeded on ASTM A514/517 steels.

The welder shall have and use approved equipment for checking preheat and interpass temperatures at all times while welding is in progress.

| **Table 3** | | |
|---|---|---|
| **Minimum Preheat and Interpass Temperature forManual Shielded Metal-Arc Welding,Flux Cored Arc Welding orGas Metal-Arc Welding** | | |
| | **Manual or Semiautomatic Gas Metal-Arc Welding, Flux Cored Arc Welding or Manual Shielded Metal-Arc Welding with Low Hydrogen Electrodes** | |
| **Thickness of Thickest Part at Point of Welding** | **ASTM A 36; A 242; A 441; A 572 Grades 42,45 and 50; A 588** | **ASTM A 514/517** |
| To 3/4 inch, incl. | 50 F | 50 F |
| Over 3/4 inch to 11/2 inches, incl. | 70 F | 125 F |
| Over 11/2 inches to 2 1/2 inches, incl. | 150 F | 175 F |
| Over 21/2 inches | 225 F | 225 F |

1. These temperatures are the minimum required for the thinner material shown for each increment and higher preheat on a step basis will be required for the thicker material within each increment. Preheat and interpass temperatures must be sufficient to prevent crack formation and welding shall be carried continuously to completion or to a point that will assure freedom from cracking before the joint is allowed to cool below the minimum specified preheat and interpass temperature. Temperature above those shown may be required for highly restrained welds.

2. When E7010 electrodes are permitted for tacking or temporary root pass, the material shall be pre-heated according to the following:

| **Thickness of Thickest Part** | **Preheat for Tacking orTemporary Root Pass** |
|---|---|
| 1/2 inch and less | 150 F |
| 9/16 inch through 3/4 inch | 200 F |
| 13/16 inch through 1 1/2 inches | 300 F |
| Over 1 1/2 inches | 400 F |

3. When joining steels of different strengths or thickness with groove welds, the preheat and interpass temperatures for the higher strength steel and the average plate thickness shall be used. For fillet welds, the preheat shall be used for the higher strength steel and the thickest plate being welded.
4. When the base metal temperature is below 32 F, preheat to at least 70 F and maintain this minimum temperature during welding.
5. Heat input when welding A 514/517 steel shall not exceed the steel producer's recommendations.
6. When moisture is present on the base metal it shall be preheated to 200 F before welding is started.

### 723.6 Quality of Welds

Weld metal shall be sound throughout.

There shall be no cracks in any weld or weld pass.

There shall be complete fusion between the weld metal and the base metal and between successive passes throughout the joint.

Welds shall be free from overlap and the base metal free from undercut more than 1/100 inch deep when its direction is transverse to the primary stress in the part that is undercut. Undercut shall not be more than 1/32 inch deep when its direction is parallel to the primary stress in the part that is undercut.

All craters shall be filled to the full cross section of the welds.

All welds on ASTM A 514/517 steel shall be visually examined for longitudinal or transverse cracks not less than 48 hours after completion of welding.

### 723.7 Corrections

When the weld quality is unsatisfactory, the following corrective measures will be required by the Engineer whose specific approval shall be obtained for making each correction.

When requirements prescribe the removal of part of the weld or a portion of the base metal, removal shall be by oxygen gouging or arc-air gouging.

Oxygen gouging shall not be used on ASTM A 514/517 steel or for A 588 weathering steel.

Backgouging of splices in beams and girders or cutouts of defective welds shall be done by arc-air gouging by a welder qualified to make beam and girder splices.

Where corrections require the deposition of additional weld metal, the sides of the area to be welded shall have sufficient slope to permit depositing new metal.

Defective or unsound welds shall be corrected either by removing and replacing the entire weld or as follows:

1. Excessive convexity. Reduce to size by grinding off the excess weld metal.

2. Shrinkage cracks. Cracks in base metal, craters and excessive porosity. Remove defective portions of base and weld metal down to sound metal and replace with additional sound weld metal.
3. Undercutting, undersize and excessive concavity. Clean and deposit additional weld metal.
4. Overlapping and incomplete fusion. Remove and replace the defective portion of weld.
5. Slag inclusions. Remove the parts of the weld containing slag and replace with sound weld metal.
6. Removal of adjacent base metal during welding. Clean and form full size by depositing additional weld metal.

Where corrections require the deposition of additional weld metal, the electrode used shall be smaller than that used for making the original weld. Surfaces shall be cleaned thoroughly before rewelding.

A cracked weld shall be removed throughout its length, unless the extent of the crack can be ascertained to be limited, in which case the weld metal shall be removed 2 inches beyond each end of the crack and repairs made.

Where work performed after the making of a deficient weld has made the weld inaccessible or has caused new conditions making the correction of the deficiency dangerous or ineffectual, the original conditions shall be restored by removal of welds or members or both, before making the necessary corrections or else the deficiency shall be compensated by additional work ac-cording to a revised design approved by the Engineer.

Improperly fitted and misaligned parts shall be cut apart and rewelded.

Members distorted by the heat of welding shall be straightened by mechanical means or by the carefully supervised application of a limited amount of localized heat. Heated areas shall not exceed 1200 F as measured by Tempil-sticks or other approved methods for steel up to 65,000 psi yield strength. Parts to be heat straightened shall be substantially free of stress from external forces, except when mechanical means are used in conjunction with the application of heat.

Heat straightening of A 514/517 steel shall be done only under rigidly controlled procedures, subject to the approval of the Engineer. In no case shall the maximum temperature of the steel exceed 1100 F. Sharp kinks and bends shall be cause for rejection of the material.

### 723.8 Radiographic Inspection

Radiographic testing required in the field shall be done at the expense of the Contractor by an approved laboratory as defined by "General Conditions" having prior approval of the Engineer. The testing shall include furnishing all materials, equipment, tools, labor and incidentals necessary to perform the required testing. The Owner may require further tests as necessary conforming to "General Conditions" and may perform additional testing including other types.

Radiographic equipment, procedures, resulting radiographs, identification marks, penetrameters, examination, reports and weld surface preparation shall conform to TXDOT Bulletin C-5. The Engineer will examine and interpret the resulting radiographs.

Radiography shall be done within the time interval specified by the Engineer. Field welds on ASTM A 514/517 steel shall not be radiographed until a minimum of 48 hours after completion of the weld.

When so indicated, welded butt splices shall be radiographed. Radiographic testing shall be as indicated in "Radiographic Inspection", above. Weld quality shall be as follows:

> There shall be no cracks and the sum of the greatest dimension of porosity and fusion type defects shall not exceed 1/10 of the nominal bar diameter in inches. The Engineer will examine and interpret the resulting radiographs, which shall become the property of the Owner and remain with the Engineer.

For field welds of splices in material with a specified yield strength of less than 65,000 psi, radiographic inspection will be made of the full flange width of 25 percent of all flange splices and of 1/3 the depth of the web of 25 percent of all web splices on each structure (17 inches minimum length). If unacceptable work is found, an additional radiograph (penalty shot) shall be made on a section welded by the same operator just prior to and just following the section containing the defect. Welds requiring repairs shall be retested by radiography after repairs are made. Necessary repairs shall be made prior to any further work being done.

For field welds of splices in material with a specified yield strength greater than 65,000 psi, radiographic inspection shall be made on all flange and web splices. Welds requiring repairs shall be retested by radiography a minimum of 48 hours after repairs are made.

All radiography (penalty shots and retakes) required because of unacceptable welding shall be performed at the expense of the Contractor.

When radiographic inspection of particular welds is indicated, this shall be in addition to the radiographic inspection required herein.

All resulting radiographs shall become the property of the Owner and remain with the Engineer.

All groove welds designed to carry primary stresses shall be subject to radiographic inspection. When subjected to such inspections, the presence of any of the following defects in excess of the limits indicated will result in rejection of the defective weld until corrected.

1. Sections of welds shown to have any cracking, regardless of length or location, incomplete fusion, overlapping or inadequate penetration shall be judged unacceptable.
2. Inclusions less than 1/16 inch in greatest dimension including slag, porosity and other deleterious material, shall be permitted if well dispersed so that the sum of the greatest dimensions of the inclusions in any linear inch of welded joint shall not exceed 3/8 inch.
3. Inclusions 1/16 inch or larger in greatest dimension shall be permitted provided such defects do not exceed the limits indicated or described above.
4. There shall be no inclusion greater than 1/16 inch within 1 inch of the edge of part or member at the joint or point of restraint.

### 723.9 Reinforcing Steel

Provisions are made herein for the welding of reinforcing steel by the manual shielded metal-arc process. Other processes may be permitted with the specific approval of the Engineer or may be specified on the plans. When the Cadwell process is permitted, a "C" series splice shall be used with grade 40 reinforcing steel and a "T" series splice shall be used with grade 60 reinforcing steel, unless otherwise indicated.

**(1) Base Metal**

Reinforcing steel to be welded shall be new billet steel conforming to ASTM A 615 and to the following chemical composition:

| | |
|---|---|
| Maximum Carbon | 0.40 Percent |
| Maximum Manganese | 1.30 Percent |

Mill test reports will be required conforming to Item No. 406, "Reinforcing Steel".

**(2) Filler Metal**

Low hydrogen electrodes as specified in Table 1 shall be required for all welding of reinforcing steel. Drying of electrodes shall be as specified in "Materials", above.

### 723.10 Preheat and Interpass Temperature

Minimum preheat and interpass temperatures shall be as shown in Table 4.

| **Table 4** | | |
|---|---|---|
| **Preheat and Interpass Temperature for Reinforcing Steel** | | |
| **Carbon Range** | **No. 7 & Smaller** | **No. 8 & Larger** |
| Up to and including 0.30 | None | 100 |
| 0.31 to 0.35 inclusive | None | 150 |
| 0.36 to 0.40 inclusive | 100 | 250 |
| Unknown | 250 | 400 |

For widening projects, use carbon content and bar size of new steel to determine preheat required.

### 723.11 Joint Types

For all bars No. 8 and larger, butt splices will be required. For No. 7 bars and smaller, lap splices will be required.

Fillet welds in lap splices shall be a minimum of 4 inches in length and shall be welded on each side of the lap joint. For bars No. 5 and smaller, welding from one side of the lap will be permitted by the Engineer, when it is impractical to weld from both sides of the joint, but in this case the weld shall be a minimum of 6 inches in length.

Lap welds shall conform to Table 5.

Where possible, all butt splices shall be made in the flat position. All welds for butt splices, except horizontal welds on vertical bars shall be as indicated. The backup strip will be required when access to the splice is from the top only. When bars may be rotated or

access to the splice is available from two sides the double bevel splice may be made and this type weld requires gouging out the root pass similar to a flange splice on structural steel. The root pass may be made using E7010 electrodes for all double beveled splices and the root pass shall be completely removed prior to welding the opposite side. The steel shall be preheated to 400 F if E7010 electrodes are used. Horizontal splices, on vertical bars, shall be as indicated.

**Table 5**

| Bar Size | A | B, Maximum | T, Minimum | C, Maximum | Electrode Size |
|---|---|---|---|---|---|
| No. 4 | .04 inch | 1/8 inch | 1/8 inch | 1/16 inch | 1/8 inch |
| No. 5 | .05 inch | 1/8 inch | 3/16 inch | 1/16 inch | 5/32 inch |
| No. 6 | .06 inch | 1/8 inch | | 1/16 inch | 5/32 inch |
| No. 7 | .07 inch | 3/16 inch | 5/16 inch | 1/16 inch | 5/32 inch |

### 723.12 Widening Projects

In general, the new reinforcing steel shall be either lap or butt spliced directly to the bar to be extended. When the reinforcement in the old portion of a structure is found to be of the wrong spacing, dowel bars long enough to develop the welded lap or butt splice and also develop the bar in bond, conforming to Item No. 406, "Reinforcing Steel", shall be welded to the old steel and the new reinforcement placed at the correct spacing without welding to the old steel. No measurement or payment will be made for the dowels but will be included in the unit price bid for other items in the contract.

Both old and new reinforcement shall be cleaned thoroughly prior to the preparation of the joint.

### 723.13 Welder Qualification

All welders shall be certified before working on any material which is to be incorporated into a City project, except for miscellaneous welds as defined below. Each welder must have certification papers conforming to TXDOT Bulletin C-6, showing the type of work the welder is certified to perform. The welder will only be permitted to do work covered by such papers.

Miscellaneous welds of the following types may be made by a welder who is certified for structural or reinforcing steel or a qualified welder:

> Armor joints and their supports, Screed Rail and Form Hanger Supports where permitted on Steel units, Reinforcing Steel to R-Bars for lateral stability between Prestressed Beams, Spirals or Bands to reinforcing Bars in Drilled Shaft cages, permanent Metal Deck forms, additional steel added in railing when slip form construction is used and other similar miscellaneous members that have no load carrying capacity in the completed structure.

A qualified welder is an experienced welder who is capable of making welds of sound quality, but does not have certification papers. Prior to welding operations, the Engineer or a representative of the Engineer shall check the welder's ability by a job site Miscellaneous Weld Qualification Test. The Contractor shall furnish all of the material and equipment necessary for the test.

The miscellaneous Weld Qualification Test shall consist of the following:

The welder shall make a single pass fillet weld in the vertical position 1/4 inch maximum size approximately 2 inches long on 1/2 inch plate using 5/32 inch low hydrogen electrodes in the position indicated. The welder shall stop and start again within the 2 inch length of fillet weld.

The specimen shall be visually examined and the fillet weld shall present a reasonably uniform appearance free of cracks, overlap and undercut. There shall be no porosity visible on the surface of the weld.

The specimen shall be ruptured as indicated by the application of a force or by striking with a hammer.

The fractured surface of the weld shall show complete penetration into the root of the joint and shall exhibit no incomplete fusion to the base metal nor any inclusion or porosity larger than 3/32 inch in its greatest dimension.

If a welder fails to meet the requirements of this test, a retest may be allowed under the following conditions:

An immediate retest may be made consisting of 2 test welds, as described above and both test specimens shall meet all of the requirements specified.

A retest may be made after 30 days, provided there is evidence that the welder has had further training or practice. In this case the test shall be a single specimen.

Qualification by the test herein specified for miscellaneous welding shall be effective immediately upon satisfactory completion thereof and shall remain in effect for the duration of the project.

Before welding on ASTM A 514/517 steel, a welder must present evidence, satisfactory to the Engineer, of at least 3 months satisfactory experience welding this type of steel over 1 inch thick. In lieu of such experience, a welder, previously qualified for welding with low-hydrogen electrodes or has used the proposed welding process, shall have completed a training course in welding ASTM A 514/517 steel prior to taking the welder qualification test.

Tests for certification of welders for manual shielded metal-arc welding shall conform to TXDOT Bulletin C-6. Tests shall be given by an approved laboratory. For field welding, certification by an approved laboratory will be accepted for a period of 1 month from the time of certification. During this period, the welder will be permitted to work on City projects provided the welder's work is satisfactory. If the welder's work is satisfactory during this period, the City will issue him certification papers, which will permit the welder to work on City projects, as long as the welder continues to do satisfactory work.

A welder must have passed the Basic Qualification Test for Structural Welding in the vertical (3G) and overhead position (4G) conforming to TXDOT Bulletin C-6 prior to welding on any load carrying members. Also, the welder must demonstrate to a City welding inspector a thorough knowledge of, and ability to consistently implement, the required welding procedures and make welds of sound quality and good appearance. Quality of the welds will be checked by radiography.

To work on field splices of beams and girders, a welder must be certified for and be capable of making groove welds in both the vertical and overhead position when using the manual shielded metal-arc process.

For manual (semiautomatic) gas metal-arc welding or flux cored arc welding, welder qualification tests for certification shall qualify conforming to TXDOT Bulletin C-5 and tested conforming to TXDOT Bulletin C-6 as follows:

1. Basic Test Certification for groove welds for unlimited thickness material will also qualify a welder for any equal or lower strength steel or for fillet welding in the position in which the welder is certified, using the same electrode and combination of shielding used for the test.
2. Welders shall be certified in the vertical and overhead position to work on field splices of beams or girders.
3. Tests for certification shall be given by an approved laboratory. Certification papers for gas metal-arc welding or flux cored arc welding issued by an approved laboratory will be handled in a manner similar to that used for the manual shielded metal-arc process.
4. Welders shall be qualified for each process to be used. Qualification for flux cored arc welding will not qualify a welder for gas metal-arc welding or vice versa.
5. Qualification for welding with any grade electrode will automatically qualify a welder for the use of lower grades of electrodes using the same process, i.e., qualification with Grade ER80S/E80S electrode will qualify for Grade ER70S, but not vice versa.

The certification papers issued by the City are the property of the City and may be canceled at any time.

Radiographic inspection shall be made of all qualification test plates of groove welds for the "Basic Qualification Test". If this inspection indicates any lack of fusion, incomplete penetration and defects 1/16 inch or larger in greatest dimension or if the sum of the greatest dimensions of defects less than 1/16 of an inch in greatest dimension exceeds 3/8 inch in any linear inch of weld, the weld shall be considered as failing the soundness test. This radiographic inspection shall apply only to that portion of the welds between the discard strips of the specimens as indicated in Figures 13 and 14 of Appendix B of TXDOT Bulletin C-6. The specimen plates shall be wide enough to provide a minimum of 6 inches of effective weld length for radiographic testing. Mechanical testing shall conform to TXDOT Bulletin C-6.

### 723.14 Measurement and Payment

Compensation will not be allowed under this item for the work prescribed but shall be included in the unit price item of construction in which this item is used.

**End**

Ref: 406, 721

For this Project the following list of City of Austin Standard Technical Specification Items are hereby amended with respect to the clauses cited below. No other clauses or requirements of these Items are waived or changed hereby:

**City Standard Technical Specifications**

**Series 100 – Earthwork**

| | | |
|---|---|---|
| 102S | 08/20/07 | Clearing and Grubbing |
| 104S | 09/26/12 | Removing Portland Cement Concrete |
| 111S | 09/26/12 | Excavation |
| 130S | 09/26/12 | Borrow |

**Series 200 – Subgrade and Base Construction**

| | | |
|---|---|---|
| 201S | 08/20/07 | Subgrade Preparation |
| 204S | 09/26/12 | Portland Cement Treatment for Materials in Place |
| 210S | 02/24/10 | Flexible Base |
| 236S | 08/20/07 | Proof Rolling |

**Series 300 – Street Surface Courses**

| | | |
|---|---|---|
| 360S | 09/26/12 | Concrete Pavement |

**Series 400 – Concrete Structures and Miscellaneous Concrete**

| | | |
|---|---|---|
| 401S | 09/26/12 | Structural Excavation and Backfill |
| 402S | 11/13/07 | Controlled Low Strength Material |
| 403S | 09/26/12 | Concrete for Structures |
| 410S | 09/26/12 | Concrete Structures |

**Series 500 – Pipe and Appurtenances**

| | | |
|---|---|---|
| 509S | 09/26/12 | Excavation Safety Systems |
| 510 | 10/03/13 | Pipe |
| 511 | 09/26/12 | Water Valves |

**Series 600 – Environmental Enhancement**

| | | |
|---|---|---|
| 601S | 09/01/11 | Salvaging and Placing Topsoil |
| 602S | 06/16/08 | Sodding for Erosion Control |
| 604S | 12/30/14 | Seeding for Erosion Control |
| 606S | 06/21/07 | Fertilizer |
| 608S | 09/26/12 | Planting |
| 609S | 08/18/10 | Native Grassland Seeding and Planting for Erosion Control |
| 610S | 09/26/12 | Preservation of Trees and Other Vegetation |
| 639S | 08/18/10 | Rock Berm |
| 641S | 06/21/07 | Stabilized Construction Entrance |
| 642S | 09/01/11 | Silt Fence |
| 648S | 08/18/10 | Mulch Sock |

**Series 700 – Incidental Construction**

| | | |
|---|---|---|
| 700S | 09/26/12 | Mobilization |

| | | |
|---|---|---|
| 720S | 09/26/12 | Metal for Structures |
| 721S | 09/26/12 | Steel Structures |
| 723S | 09/26/12 | Structural Welding |

In the referenced City of Austin Standard Specifications, in the Sections titled "Measurement and Payment", delete all text in its entirety and replace with the following paragraph:

**"All work items installed, provided, constructed, etc., under this specification shall not be paid for separately but shall be considered subsidiary to the unit price bid for the item of construction in which the item is used for the project. No separate pay will be provided for any work governed by this specification. The cost of all work shall include full compensation for work specified, including the furnishing of all materials, labor, overhead, insurance, equipment, etc. necessary to finish the work complete in place."**

**END**

For this project, City of Austin Standard Technical Specification Item 401S, "Structural Excavation and Backfill" dated 09/26/12, is hereby amended with respect to the paragraphs cited below. No other paragraphs or requirements of this City of Austin standard specification are changed or waived.

1. **Section 401S.1 Description,** add the following paragraph at the end of Section401S.1:

   "Excavation work on this project is "Unclassified Structural Excavation" which shall include the removal of all materials encountered regardless of their nature or the manner in which they are removed."

2. **Section 401S.2 Submittals,** The submittal requirements shall also include the following:

   Supplier and certified test results for materials proposed for use as select fill below foundations and backfill against below-ground walls

3. **Section 401S.3 Materials,** Add the following Subparagraphs:

   H. Select Fill below concrete slabs-on-grade and backfill against below-grade walls

   At the Contractor's option, one of the following materials may be used. Backfill material shall not contain more than 15-percent fines (percent passing the No. 200 sieve).

   1. Flexible Base material as defined by City of Austin Standard Specification Item 210.

   2. Class A Borrow material as defined by City of Austin Standard Specification Item 130S.

   3. Class B Borrow material as defined by City of Austin Standard Specification Item 130S, provided the material has a plasticity index less than 20.

   4. Class A and Class B Borrow materials shall be free of debris, vegetation, clay lumps or ball greater than 4 inches in diameter.

4. **Section 401S.4 Construction Methods,** Under Section B Excavation, delete Subparagraph 7 and replace with the following:

   7. Preparation of the subgrade for mat slab foundation shall be in accordance with the following:

      a) Within the footprint of the structure and for a minimum distance of 5'-0" outside of the footprint, remove all top soil, vegetation, debris, fill material, and weather limestone to expose the weathered limestone stratum (Georgetown Formation) or 4'-0" below finished subgrade, whichever is deeper. Where noted on drawings, finished subgrade elevation shall be such that final grading will allow for a 2-inch thick (or thicker) mud/seal slab plus a waterproofing membrane below the foundation.

b) The exposed subgrade- prior to placement of select fill- should be proof-rolled where possible with a heavy (minimum 20 ton) rubber-tired vehicle such as a loaded dump truck.

c) As needed to stabilize the soil, soils that are observed to rut or deflect excessively under the moving load should be removed or should be scarified and re-compacted to at least 95-percent of the maximum dry density as determined by TxDOT designation Tex-113/114-E. The soil subgrade shall not be allowed to dry-out or become saturated.

d) All proof-rolling and compaction efforts shall be monitored by the project's geotechnical representative. If no such representative is available, it is hereby recommended that Contractor hire a 3rd party geotechnical professional to ensure subgrade preparation is performed in accordance with construction documents.

e) Alternatively, soils that are observed to rut or deflect excessively during proof-rolling may be filled with CLSM as defined by the Standard Specification Item No. 402S, "Controlled Low Strength Material" or a lean concrete, such as the Class B mix as defined by the Standard Specification Item No. 403S, "Concrete for Structures".

f) Pour a concrete mud/seal slab over the prepared limestone subgrade or fill material. The mud/seal slab shall have a minimum thickness of 2-inches and may be thicker to compensate for irregularities in the prepared limestone subgrade or fill material.

5. **Section 401S.4 Construction Methods,** Under Section B Excavation, delete Subparagraph 8 and replace with the following:

8. Preparation of the subgrade for miscellaneous HVAC, electrical and mechanical pads shall be in accordance with the following:

a) Within the footprint of the structure and for a minimum distance of 1'-0" outside of the footprint, remove all top soil, vegetation, debris, and soil as required to insure that the final grading will provide a minimum of 12-inches of select fill below the bottom of the concrete pad, except as noted otherwise on the drawings.

b) Rework and compact the top 6-inches of the exposed subgrade to 95-percent of maximum density, in accordance with TxDOT Method TEX-114-E. The moisture content shall be within 3 percentage points of the optimum moisture content at the time of compaction.

c) Fill back to required grade with select fill material compacted in accordance with the requirements below.

d) Select fill shall be placed in horizontal loose lifts of not more than 8-inches in thickness. Each lift shall be compacted to a minimum of 95-percent of the maximum dry density based on TxDOT Method TEX-113-E. The moisture content shall be within 3 percentage points of the optimum moisture content at the time of compaction. Field densities shall be checked in accordance with ASTM D2922.

6. **Section 401S.4 Construction Methods,** Under Section B Excavation, delete Subparagraph 9.

7. **Section 401S.5 Bridge Foundations and Retaining Walls**,Delete this section in its entirety.

8. **Section 401S.6 Cofferdams**, Delete this section in its entirety.

9. **Section 401S.8 Backfilling**, Delete section and replace with the following:

   A. General

      1. As soon as practical, all portions of the excavation not occupied by the permanent structure shall be backfilled with the specified material. Damp-proofing or waterproofing required on below-grade walls shall be in place prior to commencement of backfilling.

      2. Backfill materials shall be placed in loose lifts not exceeding 8-inches in thickness. Each lift shall be compacted to a minimum of 95-percent of the maximum dry density based on TxDOT Method Tex-113-E. The moisture content should be within 3 percentage points of the optimum moisture content at the time of compaction.

      3. Over-compaction of the backfill shall be avoided to avoid an increase of lateral earth pressures on below-grade walls. Compaction conducted within 4-feet of the walls shall be performed with a manually-propelled compactor (weighing less than 500 pounds) to reduce lateral pressures applied to the walls. Backfill material in this zone should be placed in 6-inch loose lifts and compacted as described above.

   B. Backfill against basement walls of buildings

      Do not begin placing backfill against basement walls until the ground level floor (floor laterally supporting the top of the wall) has been poured and that floor's concrete has attained its full design compressive strength.

   C. Backfill against below-grade vault walls

      Do not begin placing backfill against the walls of below-grade vaults until the walls have been in place at least 7 days and the concrete has attained its full design compressive strength.

   D. Bedding and Backfill at utility trenches located below structural foundations

      1. Bedding material at utility trenches shall extend 6-inches below and 12-inches above the utilities in question. The bedding shall be course aggregate and shall be placed in loose lifts not to exceed 8-inches. The bedding shall be compacted thoroughly to provide uniform support for the utilities and shall fill all voids around the pipe.

      2. Utility trenches shall be backfilled with material meeting the requirements for qualified backfill. Backfill material shall be placed in loose lifts not exceeding 8-inches and uniformly compacted as described in this specification. Alternatively, trenches may be backfilled with CLSM.

**END**

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For this project, City of Austin Standard Technical Specification Item 410S, "Concrete Structures" dated 09/26/2012, is hereby amended with respect to the paragraphs cited below. No other paragraphs or requirements of this City of Austin standard specification are changed or waived.

1. **Section 410S.2 Submittals**, Delete the Subparagraph beginning with "Contractor's formwork plan…", and replace with the following:

   Prior to any construction, submit Monolith Drawings, in part or full, as directed by the Engineer. Drawings, in either two dimensions or isometric, shall clearly identify, locate, and dimension the following:

   a. Construction, contraction, and expansion joints.
   b. Embedded items.
   c. All concrete penetrations.
   d. Key elevations.
   e. Electrical conduit.
   f. All other items passing through concrete.

2. **Section 410S.3 Materials**, Delete Subparagraph "F. Waterstop", and replace with the following:

   F. Waterstops

   Unless noted otherwise on the drawings, provide self-expanding strip waterstops. These waterstops shall be manufactured from rectangular or trapezoidal strip, bentonite-free, hydrophilic material for adhesive bonding to concrete. These waterstops shall be manufactured from hydro-expansive rubber with a minimum expansion capability of 200-percent of its original volume after immersion in water.

3. **Section 410S.3 Materials**, Delete Subparagraph J. City of Austin Survey Monuments.

4. **Section 410S.4 General Requirements**, Add the following subparagraph to the end of the section:

   Sequence of Pouring Operations: When construction requires the placement of concrete in successive pours, Contractor is to submit sketch and schedule for pouring sequence. Schedule and sequence is to allow a minimum of two days (48 hours) curing of adjacent concrete on all sides prior to placing new concrete in contact with previously placed concrete.

5. **Section 410S.5 Drains**, Delete this section.

6. **Section 410S.7 Construction Joints**, Delete the subparagraph beginning with "The joint surface shall be coated with…".

7. **Section 410S.8 Foundation and Substructure**, Delete course aggregate grades 2 and 3 in the subparagraph beginning with "Concrete for foundation seals…".

8. **Section 410S.8 Foundation and Substructure**, In the subparagraph beginning with "Where a concrete seal…", delete the sentence "If the foundation concrete can be placed in

the dry at the time of construction, the seal will not be required." Replace with the following sentence:

Concrete seal slabs shall be used where they are shown on the drawings, regardless of the presence or lack of water at the time of construction.

9. **Section 410S.8 Foundation and Substructure**, Delete the subparagraph beginning with "The seal shall…".

10. **Section 410S.9 Falsework**, Delete the four subparagraphs beginning with the following sentences:

    - "Falsework, which cannot…"
    - "In general, each…"
    - "In setting falsework…"
    - "When the falsework…"

11. **Section 410S.10 Forms**, Modify Subparagraph B Timber Forms as follows:

    - In the subparagraph beginning with "Metal form ties…", add the following:

      Tapered form ties are acceptable for use.

    - In the subparagraph beginning with "All metal appliances…" and the subparagraph beginning with "Any wire ties…", change the depth to which metal appliances and wire ties shall be removed from 1/2 inch (13 mm) to 2 inches (52 mm).

12. **Section 410S.10 Forms**, Delete Subparagraph D. Form Supports for Overhang Slabs.

13. **Section 410S.12 Placing Concrete**, In subparagraph A. General, delete the entire paragraph beginning with "Exposed concrete surfaces, while…".

14. **Section 410S.12 Placing Concrete**, In Subparagraph C. Placing Temperature, delete the paragraph that paragraph that states "The height of freefall of concrete shall be limited to 5 feet (1.575 meters) to prevent segregation". This subject is addressed elsewhere in the specification.

15. **Section 410S.12 Placing Concrete**, In subparagraph E. Handling and Placing, add the following:

    Tremies shall be used for placing concrete in walls greater than 10-inches thick.

16. **Section 410S.12 Placing Concrete**, Delete Subparagraph G. Finishing.

17. **Section 410S.14: Placing Concrete in Hot Weather**, Add the following Subparagraph:

    Reinforcing steel, steel beam flanges, and other surfaces in contact with concrete to be cooled to below 85°F by means of water spray or other approved methods.

18. **Section 410S.16 Placing Concrete in Superstructure**, Delete this section in its entirety.

19. **Section 410S.17 Placing Concrete in Concrete Arches**, Delete this section in its entirety.

20. **Section 410S.18 Placing Concrete in Box Culverts**, Delete this section in its entirety.

21. **Section 410S.19 Placing Concrete in Foundations and Substructure**, Delete the two subparagraphs beginning with the following sentences:

    - "Placing of concrete footings…"
    - "All temporary wales…"

22. **Section 410S.20 Treatment and Finishing of Horizontal Surfaces Except Bridge Slabs**, Delete this section in its entirety.

23. **Section 410S.21 Finish of Bridge Slabs**, Delete this section in its entirety.

24. **Section 410S.22 Placing Survey Monuments**, Delete this section in its entirety.

25. **Section 410S.23 Curing Concrete**, In the subparagraph beginning with "All concrete shall…", delete "4 curing days" and replace with "7 curing days".

26. **Section 410S.24 Removal of Forms and Falsework**, Delete this section in its entirety and replace with the following:

    A. Unless otherwise indicated on the drawings, forms for vertical surfaces shall not be removed until the concrete has cumulatively cured for at least 48 hours after initial set, provided it can be done without damage to the concrete. This provision applies to the sides of beams, walls, and columns.

    B. Forms for beam soffits, joists, slabs, and other similar structural elements must remain in place for at least 7 days or until the concrete has achieved at least 75-percent of its 28-day design compressive strength.

    C. If all concrete cylinders made for the purpose of form removal have been tested without attaining the required strength, forms shall remain in place for a minimum of 14 curing days.

    D. Remove all metal appliances used inside of forms for alignment to a depth of at least 2 inches from the concrete surface. The appliances shall be manufactured to allow their removal without undue chipping or spalling of the concrete. Appliances shall leave a smooth opening in the concrete surface when removed. Rods, bolts, and ties shall not be burned-off.

27. **Section 410S.26 Finishing Exposed Surfaces**, To Subparagraph A, Item 3, add the following sentences:

    Prior to filling the holes created by tapered form ties, install tight-fitting waterproof plugs in each hole to seal the voids. Plugs shall be sized to fit and function within the middle third of the wall. After installing plugs, fill the holes with non-shrink grout at both sides of the wall.

28. **Section 410S.26 Finishing Exposed Surfaces**, Delete Subparagraph B. Rubbed Finish and replace with the following:

    B. Painted Finish

        1. All vertical surfaces of concrete that are exposed to view after all backfill and embankments are in place shall receive a painted finish. This includes all piers, columns, basement walls and retaining walls.

2. This finish shall receive the same treatment as specified for an Ordinary Surface Finish. In addition, fill all depressions and holes 1/16-inch deep or larger with mortar.

3. Prior to filling depressions and holes, expose all holes at the surface of the concrete. To do this, brush, sandblast, or water blast surfaces with a 3000 psi pressure washer.

4. Thoroughly wet surfaces and commence filling of pits, holes, and depressions while the surfaces are still damp.
5. Perform filling by rubbing mortar over the entire area with clean burlap, sponges, rubber floats, or trowels.

6. Do not let any of the new material remain on the wall surface, except that filling the pits, holes, and depressions.

7. Wipe the surfaces clean and moist cure.

8. Top coat concrete with a spray color coating made from the following ingredients:

   a) 1 quart Portland cement
   b) 1 quart white Portland cement (proportion as needed to match concrete color)
   c) 1 pint lime
   d) 2 quarts liquid latex or white casing glue
   e) 6 quarts water

9. First, mix the water and the latex. Add lime and cement and mix again. Let stand for 5 to 10 minutes and re-mix. Strain through a paint screen into the sprayer and coat the entire surface in two light coats, letting the first dry before applying the second coat.

29. **Section 410S.26 Finishing Exposed Surfaces**, Add the following subparagraph:

D. Floor Finishes

1. Floor finishes shall comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

2. Apply a float finish to surfaces to receive a trowel finish. Consolidate the surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Re-straighten, cut-down high spots, and fill low spots. Repeat float passes and re-straighten until surface is left with a uniform, smooth, granular texture.

3. Apply a trowel finish to surfaces indicated, exposed to view, or to be covered with resilient flooring, carpet, ceramic or quarry tile over a cleavage membrane, paint, or other thin-film-finish coating system. After applying a float finish, apply a first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floorings. Finish and measure surface so gap at any point between concrete surface and an unleveled, free-standing, 10-foot-long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8-inch.

4. Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated. Immediately after float finishing, slightly roughen trafficked surface by brooming with a fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

30. **Specific Cross Reference Materials**, insert the following reference:

American Concrete Institute, ACI

| Designation | Description |
|---|---|
| ACI 302.1R | Guide for Concrete Floor and Slab Construction |

**End**

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For this project, City of Austin Standard Technical Specification Item 510, "Pipe" dated 10/03/13, is hereby amended with respect to the paragraphs cited below. No other paragraphs or requirements of this City of Austin standard specification are changed or waived.

1. **Section 510.2 Materials,** Under Section (8) Pipe, delete Subparagraph (b) Iron Pipe and replace with the following:

   b) Iron Pipe

   Iron pipe shall be ductile iron pipe. For requirements, refer to Special Specifications Section 02616 Buried Ductile Iron Pipe and Fittings and Section 15072 Ductile Iron Pipe and Fittings.

2. **Section 510.3 Construction Methods,** delete Section (26) Quality Testing for Installed Pipe and replace with the following:

   26) Quality Testing for Installed Pipe

   a) Quality Testing for Installed Pipe Requirements

   Refer to Division 1, Section 01666 Testing of Pipelines.

3. **Section 510.3 Construction Methods,** delete Section (27) Pressure Pipe Hydrostatic Testing and replace with the following:

   27) Pressure Pipe Hydrostatic Testing

   a) Pressure Pipe Hydrostatic Testing Requirements

   Refer to Division 1, Section 01666 Testing of Pipelines.

**END**

# Austin Water Utility

## FACILITY SECURITY PROCEDURE FOR CONTRACTORS

**SP-1070**

**Austin Water Utility**
**Water and Wastewater Treatment Plants,**
**Water Pump Stations and Reservoirs, and Lift Stations**
**Service Centers and Administration Buildings**

# Facility Security Procedure for Contractors

## SP-1070

## Revision Record

| Version | Date | Description- Affected Pages | Approved By |
|---|---|---|---|
| 1 | 16 Sept 2014 | Updated, included all facilities<br>All pages | Rick Verardi<br>Security Mgr. |
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# FACILITY SECURITY PROCEDURE FOR CONTRACTORS

## SP-1070

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# 1 SECURITY POLICY

Paramount to the Austin Water Utility is:

- The production and delivery of adequate supply of safe drinking water to all customers
- Uninterrupted collection of wastewater, without spills, and
- Adequate processing of wastewater to safely return to the environment.

The Utility 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, equipment, and material against unauthorized entry, trespass, damage, sabotage, or other acts that might threaten the security of essential facilities, the quality of the drinking water, or the quality of treated wastewater.

# 2 SECURITY PROCEDURE

## 2.1 PURPOSE

The purpose of this Procedure is to provide Contractors and Subcontractors with standard operating methods, directives and instructions in accordance with the Utility's mission to protect its assets.

## 2.2 SECURITY PROCEDURE MAINTENANCE

The maintenance and updating of this Facility Security Procedure is the responsibility of the Security Manager with input from the Treatment Program Division Managers and Facilities Management.

This Facility Security Procedure will be reviewed and updated at least yearly. A record of all revisions will be maintained at the front of all copies.

## 2.3 RESTRICTED AREA ACCESS POLICY

### 2.3.1 Unescorted Access

Unescorted access is granted to those individuals that have completed the "Application for Authorization to Enter Secured Austin Water Utility Facilities" (Appendix B) and clear the background security check. An Austin Water Utility technology badge or badge decal will be issued.

### 2.3.2 Escorted Access

Escorted access is allowed provided an Austin Water Utility employee, a City employee representing the Utility or the Contractor provides the escort. (The Contractor must have valid unescorted access to the site.) The "Application for Authorization to Enter Secured Austin Water Utility Facilities" (Appendix B) must be submitted at least **five (5) working days** prior to the first day that employee is to work on the secured site to allow for adequate review.

The exception to submitting Appendix B for unescorted access is for those that will be on site for a short period of time, usually under one hour, such as deliver drivers. All others on site must complete Appendix B and have an escort.

## 2.4 CONTRACTOR'S BASIC SECURITY RESPONSIBILITIES

### 2.4.1 Read-and-Follow Requirement

All Contractors and Subcontractors shall read and follow this Procedure. The Contractor's Project Manager and Site Superintendent, and all Subcontractors' on-site Supervisors will be required to sign the "" (Appendix A)

attesting to the fact that they have read and understood this Procedure. The "Contractor's Acknowledgement" signed by the Contractor's Project Manager and Site Superintendent shall be delivered to the Utility at the Pre-construction Conference, and before any access is permitted to the work site. The "Contractor's Acknowledgement" signed by the Subcontractors' Project Managers and Site Supervisors will be delivered to the Utility at least **two (2) weeks** before the Subcontractor requires access to the site.

All Contractor's and Subcontractors' employees are expected to be thoroughly knowledgeable in the contents of this Procedure. Contractors and Subcontractors shall instruct their employees on the provisions and requirements of this procedure and shall emphasize the importance of their compliance. Any person's failure to follow any of the provisions or requirements of this Procedure shall be considered sufficient grounds for their immediate removal from the job site and loss of access privileges.

### 2.4.2 Basic Security Functions

The basic security functions of Contractors and Subcontractors shall center on the protection of water and wastewater quality, personnel, and the Utility's and Contractors' property. These basic functions will involve securing and monitoring the project site, controlling access, preventing unlawful entry, unlocking and locking buildings, and enforcing Utility rules, policies, procedures and directives.

Contractors and Subcontractors shall provide deterrence against fire, theft, vandalism, and trespass and shall assist in the elimination of safety hazards and security breaches. In some cases, Contractors and Subcontractors will be called upon to assist in the detection and detention of persons guilty of trespassing on or committing offenses on Utility property. Uniformed officers from the Austin Police Department and local Sheriffs' Departments shall provide the enforcement support for criminal acts committed on Utility property.

Contractors and Subcontractors shall accurately report and record all transgressions and incidents.

## 2.5 APPLICATIONS FOR AUTHORITY TO ENTER FACILITIES, BACKGROUND SECURITY CHECKS AND IDENTIFICATION BADGES

### 2.5.1 Applications for Authority to Enter Facilities

The Contractor shall submit an "Application for Authorization to Enter Secured Austin Water Utility Facilities" (Appendix B) for each of their employees and their Subcontractors' employees before that employee is allowed to enter the project site. All information requested on the application shall be provided, including required signatures. Each application submitted shall be an original document. Copies or facsimiles are not acceptable.

For ***"Unescorted"*** access, each application shall be accompanied by a complete background security check. Each employee's application and background security check shall be submitted at least **five (5) working days** prior to the first day that employee is to work on the secured site to allow for adequate review of the documents. Each background check submitted shall be an original document. Copies or facsimiles are not acceptable.

### 2.5.2 Background Security Checks

The Contractor shall submit a "Criminal History Records Check Disqualifying Criminal Offenses" (Appendix C) and provide a current background security check for each of their employees and their Subcontractors' employees, submitted along with the "Application for Authorization to Enter Secured Austin Water Utility Facilities" (Appendix B). The background check must be performed by either the United States Federal Government (FBI) or the Department of Public Safety from the employee's home state (the state in which the employee resides and from whom they obtained their driver's license or identification card). The background security check for a non-US citizen shall be performed by their native country's national law-enforcement

agency (e.g. a Canadian citizen shall submit a background check performed by the Royal Canadian Mounted Police).

The results of each background check shall be dated and submitted as an original, certified official document from the agency performing the check, and shall bear all appropriate letterheads, seals, and signatures. The background check shall clearly indicate the agency performing the check and include their address and telephone number. Background checks performed less than one year prior to the subject Contract's Notice-to-Proceed will be acceptable. The results of background checks may be audited at any time.

**2.5.3 Security Identification Badges**

Austin Water Utility utilizes two methods of Security ID Badges

**Technology Badge:** This badge is issued to contractors working at a facility for a period of time exceeding thirty days (30) days that require ***"Unescorted"*** access to the buildings. Examples are the cleaning crew, security guards, and long-term non-AWU employees. Badges are given an **expiration date** set to expire at the End of Business on the last day of the contract.

**AWU Badge Decal + Contract Company Supplied ID Badge:** This combination is used by contractors working at a facility where access to the buildings is not required. Examples are contractors working on construction projects, remodeling projects, lawn service, etc. Security Identification Badges for employees of Contractors and Subcontractors shall be picture badges as approved by Facility or Treatment Program Division Managers and authorized by the Security Manager. Contractors shall provide a Security ID Badge for each of their employees and their Subcontractors' employees who require access to protected Utility facilities to perform their work. The facilities they may access shall be limited to those locations necessary for the performance of their contract. Contractors shall provide clear, plastic badge holders with an appropriate clip or lanyard that will protect the badge and allow it to be worn and displayed safely by employees on the outside of their clothing.

The Security ID Badge shall be made of durable plastic material with minimum dimensions of 2 1/8 inches by 3 3/8 inches, and shall show a clear, photographic image of the bearer, with a vertical facial image no less than ¾ inches high. Each badge shall clearly display the first and last name of the employee and the Company he/she works for. A space at least ¾ inch high and one inch wide shall be kept free of information and shall be reserved for the Utility to apply a permanent, access authorization decal.

The Austin Water Utility's Project Manager (or Public Works PM), Plant Division Manager or Superintendent shall supervise and control the application of the permanent decal authorizing the badge bearer to enter protected Utility facilities. Such authorization to enter protected facilities shall require a review of the background security check and approval from Security Management.

The permanent decal is valid for a **two year period**, for example, decals with "14" are valid for the year of 2014 and 2015 no matter when in 2014 or 2015 it was issued. As of January 1, 2016 a new background check is required prior to the issuance of a new decal.

Austin Water Utility 2014 Decal

If the construction project continues past the decals validation date, AND the bearer still requires access, the Utility may apply a new decal to the Security ID Badge without the need of a new background check. Consult with Security Management.

### 2.5.4 Identification Badge Control and Handling

All personnel on the job site shall wear the Security Identification Badge on the outside of their clothing, in the front, at or above their waist. Arm band ID holders are acceptable.

Security Identification Badge holders will take reasonable cares to protect their badge from unauthorized use. ID badge holders will not allow others to use their badge.

In the event that a Security Identification Badge holder discovers that their badge has been lost, the badge holder shall immediately report the loss to the Contractor's Site Superintendent, who will immediately report the loss to the AWU Project Manager, and to the AWU Plant Superintendent (at treatment plants) or the AWU Operation Manager at the South First Support Center (512-972-0502) (for pump stations and reservoirs).

### 2.5.5 Revoking Access Authorization

Authorization to enter and/or work on any Austin Water Utility site is at the sole discretion of the Utility and may be revoked at any time.

Authorization to enter secured Utility sites shall be revoked immediately for the following reasons:

- The badge holder ends their employment with the Contractor or Subcontractor
- The badge holder allows another person to use their badge, or the badge holder permits, or allows another person without a badge to enter a secured site.
- The badge holder acts without authorization to defeat any security device at any secured site.
- The badge holder's actions (or inaction) result(s) in damage to Utility facilities or threaten(s) the quality of the drinking water.
- The badge holder has been involved in a criminal action on site and has been determined as a threat to any persons or property at this site.

Personnel in the following positions may revoke Access Authorization:

- AWU Director and Assistant Directors for Treatment and for Engineering
- AWU Division Heads, Plant Superintendents, and Supervisors in the Treatment Program Area
- AWU Security Manager
- AWU and Consultant's Project Managers
- City of Austin Public Works Project Managers
- Contractor's Project Manager and Site Superintendent

If a person in one of the positions listed above ever believes that another person's Access Authorization should be immediately revoked to eliminate or mitigate a threat to site security or the security of the water, they shall contact the Project Manager or the Contractor's Site Superintendent. Any decal authorizing entry to Utility protected facilities shall be removed, and at the discretion of the Contractor, the badge taken from the person. The person shall be escorted from the work site.

## 2.6 FACILITY SECURITY AND ACCESS CONTROL

### 2.6.1 Access to Facilities

Access to Utility facilities shall be limited to:

- City of Austin Public Works or Austin Water Utility employees who possess appropriate unescorted access authorization by the Utility and have a valid Security Identification Badge.
- Contractor's and Subcontractors' employees who possess appropriate access authorization(s) and possess and wear a proper Utility-authorized Security Identification Badge. All Contractor's and Subcontractors' employees will follow Utility procedures while on the site.
- Contractor's or Subcontractors' supplier delivery personnel. Delivery personnel may be permitted access to complete material deliveries and will not be required to obtain a Security Identification Badge. Delivery personnel shall be closely escorted within the secured site by the Contractor's Site Superintendent and shall be permitted access only for the time required to unload the material being delivered. Under no circumstances will any delivery personnel be allowed to remain on site for longer than one hour. If delivery of any material or equipment is projected to require more than one hour's time, an "Application for Authorization to Enter Secured Water Treatment Facilities", complete Background Security Check, and Security Identification Badge will be required for all personnel associated with making that delivery.
- Visitors who have been authorized in advance, in writing, by the Plant Superintendent or Division Manager. (Persons who perform work on the site or deliver equipment or materials to the site are not considered to be visitors) Visitors who have been authorized such access will be closely escorted within the Utility facility by either a Utility employee who possesses the appropriate access authorization and Security Identification Badge, or the Contractor's Site Superintendent (who also possesses appropriate access authorization and Security Identification Badge). The Contractor shall maintain a Visitor Register to record all visits. The Visitor Register shall record the name of each visitor, their employer, citizenship, date of the visit, arrival and departure times, the purpose of visit and the name of the escort. This Visitor Register shall be made available at every project progress meeting and shall be delivered to the Utility Project Manager at the end of the project. Visitors do not require an ID badge.

### 2.6.2 Site Security Requirements

All Utility facilities shall be kept secure at all times. The following provisions, at a minimum shall be maintained:

- An eight-foot high perimeter fence shall be maintained without gaps or holes, with gate(s) locked with a tempered chain and padlock. A security guard may also be employed if desired by the Contractor or required by other sections of the Contract.
- All perimeter door(s) (if present) shall be locked and alarmed.
- Other installed security devices (if present) such as motion detectors, fence monitors and CCTV cameras shall be operational.
- All classified material (if present) within shall be properly stored.

During the Contractor's working hours, the Contractor's Site Superintendent shall maintain an active cellular telephone to enable the Utility's Plant Superintendent or the Central Security Operator to contact him/her in the event that a security alarm is triggered on the job site. If an alarm is triggered and the Plant Superintendent or the Central Security Operator is unable to contact the Contractor's Site Superintendent to ascertain the reason for the alarm, law enforcement officers will be summoned to the site.

At the beginning of each day that the Contractor or a Subcontractor performs work on a pump station or reservoir site, a Supervisor authorized by the Contractor (and previously identified to the pump station or reservoir Central Security Operator) shall open the security gate to the site as follows:

- Place a telephone call to the Central Security Operator (512-972-0502) before unlocking the gate.
- Identify themselves and advise the Central Security Operator that they are at the site entrance, identify where on the site they intend to work, and advise that they are about to open the gate. The Central Security Operator will disarm any alarms that might be triggered by the gate opening or by employees working in the areas identified. The Central Security Operator will advise the Supervisor placing the call when the alarms are disarmed.
- Unlock the gate, enter the site, and lock the gate or post a guard to assure that only authorized personnel wearing required, proper Security Identification Badges may enter.

At the end of every work day at a pump station or reservoir site, when the last employee has left the job site, the Contractor's Site Superintendent shall place a call to the Central Security Operator to advise that everyone has left the site, that the security gate is locked, and that the alarms should be rearmed.

### 2.6.3 Combinations and Key Controls

Knowledge of the combination of locks and access to any keys will be limited to designated individuals assigned to work in the associated facilities. All combinations will be changed regularly at times designated by the Division Manager, and whenever it is suspected the combination has been compromised.

Facility keys are cut to fit a number of cylinders. If a key shared with the Contractor is lost, all similar lock cylinders, whether present on the site or off the site, will be re-keyed by the Utility, at the expense of the Contractor.

### 2.6.4 Operation of Access-Controlled Doors at Remote Facilities

Entry to all remote facilities will be coordinated with the Central Security Operator. Many facilities include an access-control door. An access-control door may be used by authorized Security Identification Badge holders for entry and exit using the following procedure:

**Entry procedure:**

1. Contact the Central Security Operator (512-972-0502) and request permission to enter. Hang up the telephone.
2. The CSO will call back the person requesting to enter (on their previously authorized number) and verify the request.
3. The CSO will unlock the door or request that the person's Security Identification Badge be presented to the exterior card reader.
4. Unlock the deadbolt (if present)
5. Enter PIN
6. Open door
7. Enter
8. Close the door

**Exit procedure:**

1. Press crash bar
2. Open door
3. Exit
4. Close the door
5. Lock the deadbolt (if present)

6. Contact the CSO and request that the door be locked, advise them that the site's alarms need to be re-armed
7. The CSO shall lock the door and re-arm all alarm devices
8. The CSO shall call back and ask the requestor to verify that the door is locked

### 2.6.5 Tailgating

Tailgating is the entry of multiple individuals through an access-controlled door or gate without closing the door (or gate) between entries. Tailgating is allowed by authorized ID Badge holders provided that each presents their badge to the card reader or person controlling access prior to entry. Tailgating by unauthorized individuals or anyone not possessing an authorized ID Badge is not allowed.

## APPENDIX A:

## CONTRACTOR'S ACKNOWLEDGEMENT
## CITY OF AUSTIN WATER UTILITY
## FACILITY SECURITY PROCEDURES FOR CONTRACTORS

**PROJECT NAME**: _____

**CIP/PROJECT NUMBER**: _____

By signing this document, I acknowledge that I have received a copy of the Austin Water Utility's **SP-1070 FACILITY SECURITY PROCEDURE FOR CONTRACTORS** 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

**SUBCONTRACTOR**: _____

PROJECT MANAGER:

_____ _____
Print Signature

SITE SUPERINTENDENT:

_____ _____
Print Signature

**APPENDIX B:**

# APPLICATION FOR AUTHORIZATION TO ENTER SECURED AUSTIN WATER UTILITY FACILITIES (CONTRACTOR EMPLOYEE)

**Date of Application:** ____ - ____ - ____ (mm dd yyyy) **Type of Access:** **Unescorted** **Escorted** (Circle one)

**PROJECT:** _____ **Cip /Proj No** _____

**CONTRACTOR:** _____

**SUBCONTRACTOR:** _____

**SITE(S) TO BE ACCESSED:** _____

**APPLICANT:** _____ _____ _____
Last Name First Name Middle Name

Job Title: _____

Home Address: _____
Street / Apt No.

_____ _____ _____ _____
City State Country Zip Code

Telephone Nos.: (_____) _____-_____ (Home) (_____) _____-_____ (Work) Birth date: _____ - ____ - _____ (mm dd yyyy)

Birth place: _____ _____ _____ _____
City County State Country

Driver's License: _____ _____ _____ _____
Number Class Exp Date (mm-dd-yr) Issuing State or Country

Signature: _____

**SUPERVISOR:** _____ _____ ____
Last Name First Name M.I.

Job Title: _____ Work Telephone No. _____

Signature: __ _____

**AUTHORIZATIONS:**

**CONTRACTOR'S PROJECT MANAGER:** _____ _____
Print Sign

**UTILITY'S PROJECT MANAGER:** _____ _____
Print Sign

**SITE / DIVISION MANAGER:** _____ _____
Print Sign

**AUTHORIZED FOR BADGE PREPARATION:** _____
Security Management

Background Check Completed / Submitted: Yes - Date _____ No "Escorted" or "Unescorted" Date Audited: _____

# APPENDIX C:

## Criminal History Records Check Disqualifying Criminal Offenses

An individual has a disqualifying offense if the individual has been convicted of, or found not guilty of by reason of insanity, any of the disqualifying crimes listed in this paragraph in any jurisdiction during the 10 years before the date of the individual's application for unescorted access authority, or while the individual has unescorted access authority. The disqualifying criminal offenses are as follows:

| | | Yes | No |
|---|---|---|---|
| **1** | Felony involving burglary. | ☐ | ☐ |
| **2** | Felony involving theft. | ☐ | ☐ |
| **3** | Felony involving dishonesty, fraud, or misrepresentation. | ☐ | ☐ |
| **4** | Felony involving possession or distribution of stolen property. | ☐ | ☐ |
| **5** | Aggravated assault. | ☐ | ☐ |
| **6** | Felony involving bribery. | ☐ | ☐ |
| **7** | Terrorist threat. | ☐ | ☐ |
| **8** | Armed or felony unarmed robbery. | ☐ | ☐ |
| **9** | Felony involving willful destruction of property. | ☐ | ☐ |
| **10** | Felony involving importation or manufacture of a controlled substance. | ☐ | ☐ |
| **11** | Extortion. | ☐ | ☐ |
| **12** | Felony arson. | ☐ | ☐ |

| | | Yes | No |
|---|---|---|---|
| **13** | Murder. | ☐ | ☐ |
| **14** | Assault with intent to murder. | ☐ | ☐ |
| **15** | Espionage. | ☐ | ☐ |
| **16** | Rape or aggravated sexual abuse. | ☐ | ☐ |
| **17** | Kidnapping or hostage taking. | ☐ | ☐ |
| **18** | Treason. | ☐ | ☐ |
| **19** | Felony involving dishonesty, fraud, or misrepresentation. | ☐ | ☐ |
| **20** | Class A Criminal Mischief (500 or Above). | ☐ | ☐ |
| **21** | Criminal Trespass at Critical Infrastructure Facility. | ☐ | ☐ |
| **22** | Burglary of Vehicle | ☐ | ☐ |
| **23** | Engaging in Organized Criminal Activity | ☐ | ☐ |
| **24** | Conspiracy or attempt to commit any of the criminal acts listed on this page. | ☐ | ☐ |

By signing below I certify that I do not have any of the above listed disqualifying criminal offenses.

Also signing below indicates my understanding that I have a continuing obligation under Title 49, CFR, Parts 1542.209 and 1544.229 to disclose to Austin Water Utility within 24 hours if I plead guilty or nolo contendere ("no contest") to, have an adjudication withheld, have been convicted or found not guilty by reason of insanity to any of the disqualifying crimes listed on this application or the federal security regulations.

Also signing below indicates the information I have provided on this application is true, complete, and correct to the best of my knowledge and belief and is provided in good faith. I understand that a knowing and willful false statement on this application can be punished by fine or imprisonment or both. (See section 1001 of Title 18 United States Code.)

| | | |
|---|---|---|
| | | |
| **PRINT NAME** | **SIGNATURE** | **DATE** |

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